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Occurrence of *Thamnophis butleri* Cope in Wisconsin

By D. Dwight Davis

THE erratic history of Butler's garter snake in herpetological literature, following the description of the species from a single specimen by Cope in 1888, is now well-known. Except for Ruthven's excellent discussions (Ruthven, 1904, 1908), almost nothing of importance has been written concerning the distribution and relationships of this little known and apparently rare species. Another feature of importance is the pressing necessity of solving such faunistic problems as still exist among forms occurring in densely populated and rapidly growing urban areas, where the extermination of wild life is only a question of time. For these reasons I believe sufficient importance attaches to additional data on this form to warrant their publication.

Thamnophis butleri Cope has heretofore been considered as occupying a limited area embracing, roughly, the western tip of New York (Bishop, 1927),[1] the western corner of Pennsylvania, most of Ohio, Indiana east of the dunes, and Michigan south of the Grand River (Ruthven, 1908). This is, in general, the region of the supposed post-glacial prairie peninsula which extended eastward from the great plains in the glaciated area north of the Ohio River.

In his discussion of *Thamnophis radix*, Ruthven (1908) makes special mention of three specimens in the National Museum from Milwaukee County, Wisconsin. Of these he says: "These specimens are typical *butleri* in coloration, and the lateral stripe is upon the third and adjacent halves of the second and fourth rows. In scutellation they agree with both *butleri* and with reduced specimens of *radix* . . . . Definite conclusions can not be based upon such a small number of specimens, but, granting the accuracy of the locality, it should, I believe, be concluded that these specimens are more than usually dwarfed specimens of *radix*" (pp. 85, 86). Pope and Dickinson (1928) include this species in their list of Wisconsin amphibians and reptiles, stating simply that the data which they present extend "the range of the species beyond the limits specified by Ruthven in his article on the garter snakes" (p. 68). Due to the kindness of Mr. S. A. Barrett and Mr. T. E. B. Pope of the Milwaukee Public Museum, I have been enabled to examine the specimens, thirty-eight in number, upon which this statement is based. An examination of the University of Wisconsin's collection of *Thamnophis s. sirtalis* has revealed an additional ten specimens. These forty-eight specimens, so far as I am aware, are the only known specimens of *butleri* from Wisconsin, aside from the three in the National Museum to which Ruthven refers (which are unquestionably *butleri*), and a specimen from Dodge County in the University of Michigan Museum (Mus. Zool. No. 64749), cited by Pope and Dickinson.

[1] William G. Hassler (*Copeia*, 1932, No. 2) reports two more records of *T. butleri* from New York. These specimens were taken in Cattaraugus County, and like Bishop's specimen, were taken on a tributary to the Allegheny River.

Ruthven's description of *butleri,* based on a series of forty-seven specimens from Pennsylvania, Ohio, Michigan, and Indiana, is the most complete account of this species which has been published. This author considers *butleri* to be a close relative of *radix,* from which it differs principally in having the entire scale formula considerably reduced; and correlated with the reduction of the dorsal scale rows to 19-17, the extension downward of the lateral stripe to cover the upper half of the second row, so that it covers the lower half of the fourth, all of the third, and the upper half of the second. All of these characters are invariably present in each of the Wisconsin specimens examined, and Ruthven states that they are also found in the three specimens from Milwaukee County which he examined. There can be no doubt, in the light of the relatively large series at hand, and the constancy of the typical characters, that we are dealing with true *butleri,* and not with abnormal *radix,* as Ruthven tentatively concluded from the meager data which he possessed.

An examination of this series reveals another pertinent fact. Ruthven states that the data which he presents indicate a reduction of the scale formula of *butleri* from west to east. This is also the case with *radix* from the Rocky Mountains east to the Illinois-Indiana line, so that where the two species meet, in western Indiana, their scale formulas tend to approximate each other rather closely. Now, the Wisconsin island of *butleri* is now, and must always have been, farther west than the range of the main body of the species. If Ruthven's conclusion is correct, we should expect to find that the scale characters of these specimens approach those of *radix* in the Chicago area still more closely than do specimens from Indiana and Michigan. This is precisely the case. Although Ruthven unfortunately does not give averages for some of his characters in his 1908 paper, and the sexes are not noted in the tables given in his 1904 paper, the data which he presents are sufficiently complete to establish this point definitely.

Ruthven records no dorsal scale formula in *butleri* which is greater than 19-17. It is interesting to note that in two of the Wisconsin specimens (Milw. Pub. Mus. Nos. 1296 and 1408) there are a very few scales on the neck (in one specimen only three) of an extra pair of rows, which seems to indicate a definite tendency toward the 19-21-19-17 formula which is typical of *radix.* In regard to the ventrals and subcaudals, Ruthven records the following extremes for a fairly large series of *butleri* from Michigan: ventrals in males, 134-146; in females, 132-140; subcaudals in males 61-66; in females 49-58. These figures for the Wisconsin series are as follows: ventrals in males 135-150, average 144; in females 136-151, average 141; subcaudals in males 63-72, average 67; in females 50-64, average 58. The tail length in this series is constantly .24 to .26 in the males, and .20 to .23 in the females. The tables for the labials (Figs. 1 and 2), which are taken from those given by Ruthven (1908: 95), show that these counts in the Wisconsin specimens average definitely higher than at any other point in the range. Although the typical 1-1 condition of the temporals, or 1-2 with the upper scale of the second row much reduced, seems to predominate in this series, sixteen of the forty-eight specimens

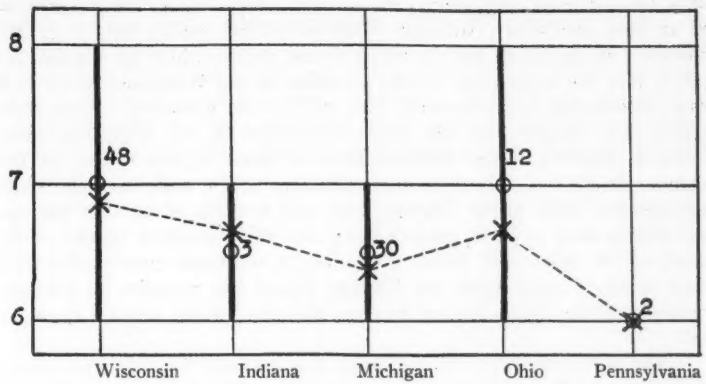

Fig. 1.—Diagram showing variation in number of supralabials in *Thamnophis butleri*. Figures to left of diagram indicate number of scutes; those on diagram refer to number of specimens from each area.

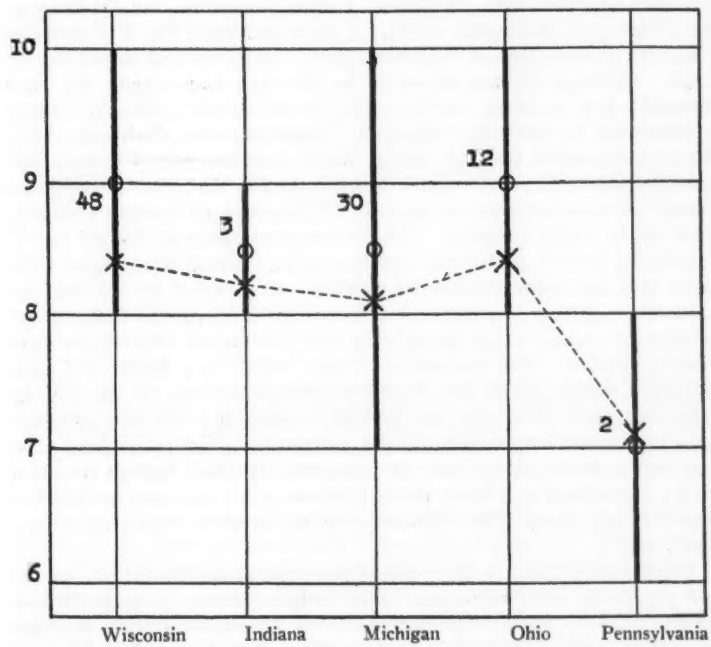

Fig. 2.—Diagram showing variation in number of infralabials in *Thamnophis butleri*.

show two, or even three, temporals of nearly equal size in the second row, on at least one side. Although Ruthven (1904) makes only a general statement in regard to this character in the *butleri* which he examined, I gather that the occurrence of this condition in the Wisconsin series is at least considerably more common than it is to the eastward. From these figures it is obvious that the entire scutellation in the Wisconsin series shows a definitely higher formula than is found in *butleri* east of this region. In spite of this close approximation to the scale formula which characterizes *radix* in the Chicago area, and in spite of the fact that the two species seem to be in contact along the entire southern border of the range of the Wisconsin island of *butleri*, a thorough examination of a large series of *radix* from the Chicago region has revealed no evidence whatever of the intergradation between the two species which I hoped to find.

There is no possibility of an existing link between the Wisconsin island of *butleri* and the main body of the species. The hope of tracing this form into the Chicago region has prompted a careful examination, both in the field and in Field Museum's collections, of hundreds of garter snakes by a number of investigators, without revealing a single specimen. This discontinuity in the range of this species presents an interesting problem with respect to the possible origin of the Wisconsin *butleri*. Specimens have been recorded from Milwaukee, Racine, Waukesha, and Dodge counties (Pope and Dickinson, 1928). I have examined the University of Wisconsin's large series of Wisconsin garter snakes without increasing this range. Although further collecting in this area may extend the range somewhat, it is apparent that the region to which this species is confined in Wisconsin is peculiarly restricted. Assuming that Ruthven's theory of the phylogeny of the *radix* group, which considers *butleri* to have been evolved from *radix*, is correct, it is inconceivable that *butleri* could have evolved simultaneously on the northern (Wisconsin) and eastern (Indiana) edges of the range of *radix*. The present distribution of *butleri* east of the existing prairies proves that the species is of post-glacial origin. This leaves only one other possible explanation—that *butleri* at one time occupied the region in northeastern Illinois and northwestern Indiana now occupied by *radix*, which would give it a continuous distribution from Illinois eastward. The pressure of *radix*, which is a larger and more aggressive species, must then have crowded *butleri* out of the Chicago region north into Wisconsin, and probably somewhat to the east into Indiana, which would have resulted in the distribution which exists now. The sluggishness of disposition and the comparatively small number of young which are produced in a litter, which Ruthven points out, lend considerable support to this view. This explanation seems to me to be the most satisfactory one.

There exists, then, in the southwestern corner of Wisconsin, an isolated population of *Thamnophis butleri* which presents a scale formula which is markedly higher than that possessed by specimens from Michigan and Indiana, and which accordingly approaches that presented by *Thamnophis radix* on the eastern edge of its range more closely than do *butleri*

found farther east. This Wisconsin population probably at one time formed the western edge of a continuous belt of *butleri* which extended from eastern Illinois eastward, and which was crowded north by an influx of *radix* from the south and west. Moreover, the discovery of this group of *butleri* seems to afford additional evidence that *T. butleri* was evolved from *T. radix* along the extreme eastern edge of the range of the latter species.

Fig. 3.—Map showing locality records for *Thamnophis butleri* in Wisconsin. List of localities and number of specimens from each: Dodge Co., Atwater (1); Waukesha Co., Menominee Marsh (3), Nashotah (1), Upper Nemahbin Lake (2), Big Bend (2); Milwaukee Co., Milwaukee (11), South Milwaukee (1), Bay View (1), Wauwatosa (1); Racine Co., Corliss (1).

In conclusion I wish to express my thanks to Mr. S. A. Barrett and Mr. T. E. B. Pope, of the Public Museum of the City of Milwaukee, for the loan of the specimens which form the basis of this paper, and to Prof. George Wagner, of the University of Wisconsin, and to Mr. F. J. W. Schmidt for the loan of specimens from that institution. I wish especially to express my appreciation to Mr. Karl P. Schmidt, of Field Museum, who originally suggested the problem, and without whose aid and kind understanding this paper could scarcely have been written.

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FIELD MUSEUM OF NATURAL HISTORY, CHICAGO, ILLINOIS.

Amphibians and Reptiles Observed Enroute to Hoover Dam

By L. M. KLAUBER

IN the spring of 1931 and again in 1932 I had occasion to join a group of power company officials on inspection trips to Hoover Dam. Although little time was available for actual collecting, and the weather was unfortunately inclement on both trips, it was possible to make some herpetological observations, premised principally on specimens collected by the roadside or auto casualties on the highway.

The itineraries may be summarized as follows:

1931

April 11	San Diego to Barstow via Riverside; evening side-trip to Newberry	255 miles
April 12	Barstow to Las Vegas, Nev.; afternoon and evening side-trips to Sloan	250 miles
April 13	Las Vegas to Mormon Mesa and return; afternoon and evening side-trips to Sloan; high wind all day	182 miles
April 14	Las Vegas to Hoover Dam; return to Riverside in the evening; windy day	322 miles
April 15	Riverside to San Diego in the morning	121 miles
	Total	1130 miles

1932

April 22	San Diego to Barstow in the afternoon; cold and windy	208 miles
April 23	Barstow to Needles; side-trip to Topock; cool and breezy	186 miles
April 24	Needles to Las Vegas via Searchlight; side-trip to Sloan; cool and windy	154 miles
April 25	Las Vegas to Hoover Dam and return; evening trip to Utah line and return; cold and with high winds	297 miles
April 26	Las Vegas to San Diego; cold and windy; occasional squalls of rain	360 miles
	Total	1205 miles

The Mohave Desert, which includes all the localities herein mentioned eastward of the Cajon Pass in San Bernardino Co., is a never-ending delight to the herpetologist. A succession of mountains, or mountain groups, partly drowned in their own alluvial fans, lava flows, sand slides, dry lakes and flats, and, above all, the enormous fans themselves, constitute a continuously changing vista. Some of the species are found in every habitat; others are in more restricted ecological niches and one wonders how these have gained such widespread distribution with their habitats so scattered amid unfavorable areas.

Although nothing novel was discovered we had the good fortune to add two species, *Phyllorhynchus decurtatus* and *Crotalus scutulatus,* to the Nevada list of reptiles.

In these trips only five counties (all of considerable size) were traversed, these being San Diego, Riverside, and San Bernardino counties in California; Clark County in Nevada; and Mohave County in Arizona. No specimens were collected in the last named. In the following notes the localities are identified by counties, but, to avoid repetition, the names of the states have been omitted.

Amphibians

Scaphiopus hammondii

Western Spadefoot Toad

A specimen was hopping on the road at Bonsall, San Diego Co., late on a rainy evening.

Bufo canagicus halophilus

California Toad

Noted at Escondido and Rainbow, San Diego Co.; and Temecula, Riverside Co. The Escondido specimen was alive, the others crushed on the road by automobiles.

Bufo californicus

Arroyo Toad

We stopped for a few moments at about 9 P.M. on the bridge over the Mohave River, near Victorville, San Bernardino Co., and listened to the beautiful, penetrating trill of this toad. On the second trip, the night being cold, the toads were silent.

This is the first time this species has been recorded beyond the divide, and carries the range 65 miles to the east of the nearest previously recorded specimen (Sunland, Los Angeles Co.). Our ears would not have been trusted had not several specimens been collected at this point on two other occasions.

Bufo cognatus

Great Plains Toad

At Needles, San Bernardino Co., we heard the harsh, chattering call of this toad, in sharp contrast to the melodious trill of the previous species.

Hyla regilla
Pacific Tree-frog

This widespread species was heard calling at Victorville and Barstow, San Bernardino Co.; Elsinore, Wildomar, Murrieta, and Temecula, Riverside Co.; and Rainbow, Fallbrook, Bonsall, Vista Buena, San Marcos, Escondido, Bernardo, Poway, and Mission Valley, San Diego Co. Finding these frogs at Barstow exemplifies their tendency to follow the eastbound streams down the mountains and out onto the desert until the water is lost in the sand.

Rana aurora draytonii
California Red-legged Frog

This species was found to be common at Victorville on the banks of the Mohave River. These specimens have redder legs than those in San Diego Co. The frogs were found to be easy to collect at this point on a previous trip, by the use of a flashlight; for when the light shines in the eyes of the quarry it remains quiet, whether in the water or on shore. This simplified the catching of this ordinarily wary species.

LIZARDS

Coleonyx variegatus
Banded Gecko

Specimens were collected at Glendale, Clark Co.; and Beal and Wheaton Spring, San Bernardino Co. The first specimen was found on the highway on a cold night at 8:40, with so strong a wind blowing that the lizard seemed to be having difficulty in holding its place. The second had just been run over at 9:30. The last specimen was found in the daytime under a fallen yucca.

The Wheaton Spring specimen, taken at an altitude approximating 4,000 ft., has regular cross-bars, while the others are spotted. I had previously noted that most coastal specimens, or those from higher altitudes, resemble the former, while desert specimens have imperfect bars or are spotted. An examination of 48 specimens from the southwest indicates that Upper Sonoran individuals are likely to have more perfect cross-marks and to be of somewhat smaller adult size than the desert specimens; however, there are exceptions, for some few of the Lower Sonoran specimens are barred, but I have yet to see a spotted individual from an Upper Sonoran locality.

Dipsosaurus dorsalis dorsalis
Northern Crested Lizard

Observed at Daggett, Ludlow, and Fenner, San Bernardino Co.; as usual, this lizard was particularly evident in the vicinity of mesquite hummocks.

Crotaphytus collaris baileyi
Western Collared Lizard

A single specimen of this rock inhabiting species was collected on a boulder strewn hill in San Bernardino Co., just over the California line from State Line Wells, Clark Co. (US 91).

Crotaphytus wislizenii

Leopard Lizard

Specimens were noted at Hector, Siam, and Halloran Spring, San Bernardino Co.; at Boulder City, and in the Piute Valley (10 miles south of Searchlight and also one mile north of the California line, on the Arrowhead Junction-Searchlight road), Clark Co. These desert specimens are larger and lighter in color than those found on the coastal side of the mountains in southern California.

The leopard lizard, although widespread in the southwest and unrestricted in character of habitat (being found alike in sand, rocks, or brush), seems never to be so numerous in any particular locality as are, for instance, *Callisaurus, Dipsosaurus,* or *Cnemidophorus.* When traveling at full speed it is difficult to distinguish from the two latter.

The Hector specimen was found in black lava and twice took refuge under stones rather than down holes, although plenty of the latter were available.

Sauromalus obesus

Chuckawalla

Two were collected at Hector, San Bernardino Co., and one was observed at Searchlight, Clark Co. We were told by the substation operators that they are very plentiful on the cliffs above the site of Hoover Dam. One of the Hector specimens was first seen in a bush, evidently feeding; it quickly took refuge in the lava whence it was extracted with difficulty. Although the chuckawalla is widely distributed throughout the desert regions of southern California, I have never found it except in rocky sections and thus it is absent from great areas of sandy wastes.

Callisaurus ventralis ventralis

Gridiron-tailed Lizard

This species, except for *Uta stansburiana,* is the most plentiful lizard in the deserts of southeastern California. More individuals of this species are observed run over on the highways than of all other species taken together.

On these two trips the gridiron-tailed lizard was collected or observed at the following points: Ludlow, Bagdad, Daggett, Hector, Lavic, Argos, Klondike, Siberia, Haynes, Amboy, Marble Mts. (at US 66), Arimo, Essex, Beal, Ibis, Arrowhead Junction, Soda Lake, Baker, Halloran Spring, and Wheaton Spring, San Bernardino Co.; and Glendale, Sloan, Boulder City, rock rim above Hoover Dam, Las Vegas Wash, 11 and 16 miles southeast of Las Vegas, and Piute Valley (10 miles south of Searchlight and also one mile north of the California line on the Searchlight-Arrowhead Junction road), Clark Co.

Although evidently preferring sandy areas, the species is by no means uncommon where rocks predominate. It runs very swiftly with the tail curled over the back, and then stopping suddenly, is difficult to perceive. Characteristically it pauses close to a bush in which it can take refuge and usually with a second bush intervening between itself and

the intruder. Although having worthy competitors in *Dipsosaurus, Cnemidophorus tessellatus,* and *Crotaphytus wislizenii,* I think this the fastest lizard on the desert. When fully alarmed and running across the line of sight it is almost impossible to follow with the eye.

Specimens, particularly the larger males, are often noted perched for observation on the tops of small boulders, the bodies being raised off the surface, probably to avoid the heat, and with the head bobbing up and down in the manner characterizing so many lizards.

At Bagdad two large males were playing or fighting on the highway. When approached one bobbed his head and displayed his throat-fan prominently, something I had never observed before.

Uma notata

Ocellated Sand Lizard

Three specimens were collected on a sand slide on the lee side of a rocky hill at Ludlow, San Bernardino Co. One wonders how these lizards, so restricted in habitat, are able to find the widely scattered sand dunes and slides wherein they dwell in the desert areas.

The Ludlow specimens seem not to differ in color from those from the sandhills west of Yuma, which constitute the great *Uma* headquarters. They have the same characteristic method of escape—a rush behind the nearest bush where they take refuge in a ground hole, or more often by swimming under the sand surface.

Uta stansburiana stejnegeri

Desert Brown-shouldered Lizard

This lizard, without doubt the most plentiful (in the form of this and other subspecies) in almost every area in southern California, is equally at home in brush, stony, or sandy areas. It generally takes refuge in ground holes.

On these trips specimens were observed or collected at Hector, Piute, Todd, Halloran Spring, and Yucca Station, San Bernardino Co.; and Glendale, Dry Lake, Las Vegas, west rim above Hoover Dam, Searchlight, Mesquite Dry Lake, Piute Valley (one mile north of California line on the Arrowhead Junction-Searchlight road), and Jean, Clark Co. At Hector specimens were plentiful in black lava; at Las Vegas in mesquite sand-hummocks.

Sceloporus occidentalis biseriatus

Western Fence Lizard

Observed at Escondido, San Diego Co.

Sceloporus magister

Desert Scaly Lizard

Specimens were taken at Wheaton Spring and Yucca Station, San Bernardino Co.; Jean and in Piute Valley (one mile north of the California line), Clark Co. This species is primarily a shrub-inhabiting form. All of the four specimens above mentioned were taken under fallen yucca trunks in cool or cold weather.

Phrynosoma blainvillii blainvillii
Southern California Horned Toad

Specimens were observed at Rosedale, Poway, and Rainbow, San Diego Co.; and Temecula, Elsinore, and Perris, Riverside Co.

Phrynosoma platyrhinos
Desert Horned Toad

Specimens were observed crushed on the highway at Amboy, Klinefelter, Siberia, and Essex, San Bernardino Co.; and Las Vegas, Sloan, and Erie, Clark Co. The only live specimen was found on a sand hummock at Daggett, San Bernardino Co. This species is the only horned toad found in the northern Mojave; it is very plentiful in some areas, particularly on rocky alluvial fans.

Xantusia vigilis
Desert Night Lizard

This species was collected at Wheaton Spring, Yucca Station, Mountain Pass, and Piute Mts. (south of Goffs), San Bernardino Co.; and five miles north of Jean and in Piute Valley (one mile north of the California line on the Searchlight road), Clark Co. I was pleased to secure the Nevada specimens, as the night lizard had previously been reported from only one locality in that state (Pahrump Valley).

All of the specimens collected were found under fallen yucca trunks, but the preferred harbor was the Spanish dagger (*Yucca mohavensis*) rather than the Joshua tree (*Y. brevifolia*). Even at such points as Yucca Station, Mountain Pass, or Jean, where both species of yucca were available, the lizards were more often under the smaller shrub, and they were found at other points where no tree yuccas were present. Favorite hiding places were under thoroughly rotted trunks from which the leaves had already been stripped, although some were between bark and stem, and others under branches still retaining their leaves. Under many stems termites were discovered; these no doubt constitute the food of the lizards. Some of the trunks were distinctly warm from the effects of rotting; in any case the lizards are well protected by the poorly heat-conducting cellular trunk and thus it is possible to find them in inclement weather. In fact, when collecting in warm weather at Cabazon, Riverside Co., a few weeks later, the lizards were so lively that they were much more frequently lost when uncovered.

Cnemidophorus tessellatus tessellatus
Desert Whiptail Lizard

Desert whiptails were quite common in many areas, whether sandy or rocky. They were collected or noted at Daggett, Hector, Ludlow, and Lavic, San Bernardino Co.; and Las Vegas, Searchlight, and 1, 3, and 5 miles north of the California line on the Arrowhead Junction-Searchlight road, Clark Co. At Las Vegas the lizards were found in mesquite sand-hummocks; at Hector in black lava scattered on sand.

One cannot but note the peculiar jerky motion, with frequent pauses, that characterizes the progress of this lizard when undisturbed, as compared with its great speed when alarmed.

Snakes

Lichanura roseofusca roseofusca
California Boa

One specimen of the usual mottled, coastal form at Bonsall, San Diego Co. Association: Fields and a creek bank.

Masticophis flagellum frenatus
Red Racer

Six large specimens were noted dead on the highway as follows:

Vista	San Diego Co.	(fields)[1]
Bonsall	San Diego Co.	(fields, brush)
Temecula	Riverside Co.	(fields)
	Very bright red with black head	
Elsinore	Riverside Co.	(light brush and granite)
Garnet	Clark Co.	(level plain, grass and light brush)
	Anteriorly red; yellow toward the tail	
Dry Lake	Clark Co.	(brush, sandy wash)

Masticophis lateralis
California Striped Racer

Six specimens were found crushed on the highway, all adults:

Mission Valley	(brush)
Rosedale (2)	(brush)
Vista	(fields, brush)
Bonsall	(fields, creek)
Devore	(brush, creek)

All localities are in San Diego Co., with the exception of the last, which is in San Bernardino Co.

Salvadora grahamiae hexalepis
Western Patch-nosed Snake

The following specimens of this widespread form were seen, all road casualties:

Bonsall	small	(brush)
Bonsall	large	(brush)
Red Mountain	medium	(brush)
Nebo	medium	(thin brush, rocks)
North end Piute Mts.	large	(rocky alluvial fan, brush and cactus)
Klinefelter	medium	(rocky alluvial fan, brush)
Mountain Pass	small	(brush, rocks)
Wheaton Spring	small	(brush, rocks)

The first three localities are in San Diego Co., the others in San Bernardino Co. All of those from the latter county have the color and pattern characteristic of the desert areas, that is, a wider and lighter dorsal stripe, and lighter sides than the coastal specimens from San Diego Co.

[1] Indicating the association; where two items are given the characters of the two sides of the road differ.

Phyllorhynchus decurtatus
Lower California Leaf-nosed Snake

A small specimen was found in a desert association 2 miles north of Topock bridge on the California side of the Colorado River in San Bernardino Co.

A second small specimen was found crushed on the highway 5 miles southwest of Glendale in Clark Co. This, I think, is the first Nevada record for this species, extending the range about 130 miles to the north, the nearest previous locality being 3 miles south of Needles, San Bernardino Co.

This Nevada specimen was found on a high, rocky mesa with sparse vegetation. It has 35 body spots and 7 on the tail. The secondary spots are moderately well defined.

Arizona elegans occidentalis
Western Faded Snake

A large specimen was found dead in the road at Garnet, Clark Co. The ground color was light brown, the spots dark brown; the color seemed midway between the dark coastal specimens of California and the light individuals from the Colorado Desert. The association was a plain, with scant brush.

Pituophis catenifer annectens
San Diegan Gopher Snake

Specimens were noted as follows:

Mission Valley	medium	(brush)
Escondido	large	(orchard)
Bonsall	large	(creek and fields)
Bonsall	small	(creek and fields)
Rainbow	small	(fields)
Val Verde	small	(fields)
March Field	small	(fields)
Riverside	small	(orange groves)

The last three localities are in Riverside Co., the others in San Diego Co. It is of interest to note, as is usually the case with this species, first, the large proportion of juveniles (5 out of 8 in this instance) that are killed by automobiles; and secondly, the preference for cultivated areas.

Pituophis catenifer deserticola
Desert Gopher Snake

Eight specimens of this well defined subspecies were seen:

Bryman	large	(sparse brush)
Wild	large	(desert)
Yermo	large	(rocks)
Halloran Spring	large	(brush, sand)
Mountain Pass	large	(light brush)
Glendale (2)	medium	(sparse brush and rocks)
State Line Wells	medium	(rocky desert, light brush)

With the exception of Glendale and State Line Wells, which are in Clark Co., all localities are in San Bernardino Co.

Only one of these specimens was collected alive. This was one of the two from Glendale; it was found crossing the highway at 8:30 on a cold, windy night.

These specimens show the usual characteristics of Mohave Desert gopher snakes. The ground color is generally pink or cream, with square blotches, which are quite even toward the tail, but which tend to run together at mid-body, and approach para-vertebral stripes on the neck.

Lampropeltis getulus boylii
Boyle's King Snake

Four specimens noted:

Vista (2)	medium	(fields)
Bonsall	large	(fields)
Temecula	large	(brush, creek)

The first two localities in San Diego Co.; the third Riverside Co.

Rhinocheilus lecontei
Long-nosed Snake

Seven specimens were observed and constitute a series showing the characteristic color modification from coast to desert and eastward.

Two specimens from the vicinity of Elsinore, Riverside Co., have solid black blotches dorsally, with solid red between. On the sides the black is less continuous and the red likewise. An intermediate specimen from Helendale, San Bernardino Co., has less solid black blotches, and the red, while quite evident on the sides, is almost absent from the mid-dorsal area. A fourth specimen, from further out on the Mohave at Yermo, San Bernardino Co., is entirely black and white, the red having disappeared from the interspaces. The black is nearly solid dorsally, but spotted with white on the sides. Continuing eastward there is a tendency to return to the coastal pattern, as indicated by specimens collected at Sloan and Boulder City, Clark Co.; and 3 miles north of Topock Bridge, San Bernardino Co. All of these have considerable red or pink in the interspaces between the black.

Only the Sloan specimen was collected alive. This was at the side of the highway on a cool, windy night at 8:30. It may have been stalking a mouse which was playing on the road nearby.

Sonora occipitalis
Shovel-nosed Ground Snake

A single specimen was picked up at Baker, San Bernardino Co. The interspaces between the dark brown blotches are faintly suffused with pink. The association was typically desert. In better weather many more of this relatively common desert species would no doubt have been seen.

Hypsiglena ochrorhynchus
Spotted Night Snake

A badly crushed specimen was noted on the highway opposite Sloan, Clark Co. It had swallowed a lizard. The association was light brush and rocks.

Thamnophis sirtalis infernalis
Pacific Garter Snake

A medium sized specimen was noted on the road beside a creek at Bonsall, San Diego Co.

Crotalus scutulatus
Mohave Rattlesnake

A single specimen, in moderately good condition, was found dead on the road 12 miles south of Las Vegas, Clark Co. So far as I am aware, this is the first of the species to be reported from Nevada, the nearest previous record being the Providence Mountains and Goffs, about 80 miles to the south in California.

This specimen is of the olive-green color typical of those from the Mohave, and shows no tendency toward *Crotalus confluentus lutosus*. There are two internasals and 13 scales before the supraoculars. The scales between the latter number 2+4.

Crotalus confluentus stephensi
Panamint Rattlesnake

Tacked to the wall of the boat-house at Las Vegas Landing on the Colorado River was a skin, which although without head, might be identified as this species. It was said to have been collected within a few hundred feet of this point. It was of the color characteristic of the southern Nevada specimens, that is, dark brown blotches on a light brown punctated ground color. The tail had brown rings.

The boatman said this species was not uncommon thereabouts. It will be remembered that the Death Valley Expedition collected three rattlers in (Las) Vegas Wash.

Crotalus confluentus mitchellii
Bleached Rattlesnake

Three specimens were found run over on the road, all in the vicinity of Needles in San Bernardino Co., the localities being the northeast slope of the Piute Mts., Klinefelter, and 3 miles north of Topock Bridge. The associations in all cases were rocky with light brush. The ground colors were gray, with blotches less distinct than is usual in more westerly specimens. As to the lack of prenasal-rostral contact, which is the outstanding *mitchellii* characteristic, this was found to be typical in two specimens, but in the third contact is made at the lower half of the prenasal on each side, thus approaching *C. c. stephensi*.

Crotalus confluentus oreganus
Pacific Rattlesnake

A juvenile casualty on the road at Fallbrook, San Diego Co.; brush and grass.

Crotalus cerastes
Sidewinder

The following specimens of this common desert form were noted:

Helendale	large DOR[1]	(desert)
Wild	large DOR contained a mouse	(desert)
Barstow	large DOR contained a mouse	(desert)
Gale	large, run over but still squirming	(desert)
Newberry	small, caught crossing the road at 8:15 P.M.; moderately cool breeze blowing	
Cronese	large DOR	(desert)
Dry Lake	contained in a *Masticophis flagellum frenatus*	
Glendale	large, caught crossing the road at 8:25 on a cold, windy night	
Mormon Mesa on US 91, near Virgin River	medium, caught crossing the road at 7:45 P.M.; a strong, cold wind blowing	

The first six localities are in San Bernardino Co., the last three in Clark Co. The finding of the Glendale and Mormon Mesa specimens was a distinct surprise to the collector; a more unlikely night for snakes could hardly be imagined, yet these desert reptiles, which are presumed to thrive in high temperatures, were active and agile. The two Nevada specimens are distinctly darker than normal California and Arizona individuals; however, this may be the result of the temperature, for they were not warmed prior to preservation.

TURTLES

Gopherus agassizii

Desert Tortoise

This species was noted at Wild, Ludlow, Hector, Midway, Arrowhead Junction, and 10 miles south of Searchlight in the Piute Valley. All of these localities are in San Bernardino Co. Only two of these specimens were alive; at Wild a large individual was crawling along the road in the late afternoon; at Arrowhead Junction a very large specimen was found active at mid-morning. The other localities are those where shell remains were found. Evidently these tortoises have enemies which are able to destroy them in spite of the protection of the shell; in two instances the shells were intact, in two others crushed and scattered.

ZOOLOGICAL SOCIETY OF SAN DIEGO, SAN DIEGO, CALIFORNIA.

[1] Dead on the road.

Two Species of Terrapin in Cuba: The Antillean Terrapin *Pseudemys rugosa*, and the Cuban Terrapin, *Pseudemys decussata*

By C. Ralph De Sola and Arthur M. Greenhall

Introduction

WITH reference to our title, Schmidt (1921) believes that each island of the Greater Antilles is inhabited by a species of *Pseudemys*, Stejneger (1900, 1904) would hold this belief but for lack of material, and Barbour (1919, 1930) confesses that he is conservative in such matters although he is aware that every Cuban *guajiro* recognizes more than one species in Cuba. We offer here evidence of two distinct species of *Pseudemys* in Cuba, and in our summary add a note favoring the validity of the Porto Rican *P. stejnegeri* of Schmidt (1928; also Grant, 1931).

Some solution may now be given to the long standing and perplexing problem concerning the terrapins of Cuba, and the multiplicity of West Indian forms. The results set forth are deduced from a collection of twenty-two terrapins collected in Cuba by the junior author during the spring of 1930 and the summer of 1931, and the field notes and observations of the senior author, who made cheloniological studies in that region during the spring and summer of 1929.

We are grateful for facilities extended us by Mr. Clifford S. Pope, of the American Museum of Natural History, and Mrs. Helen T. Gaige, of the Museum of Zoology, University of Michigan.

Material

It is interesting that all our material was collected in a restricted locality near Martí, in the Province of Camagüey, Cuba, for our specimens separate into two distinct groups, one that of the widely ranging *Pseudemys rugosa*, the other a type markedly different and apparently confined to Cuba, *Pseudemys decussata*, for forty-two years buried in the synonymy of *rugosa*.

Pseudemys rugosa (Shaw)[1]

Pseudemys rugosa Flower, Vert. Anim. Zool. Soc. London, Rept. 3, 1927: 11. (Shaw is given as the authority for the species on grounds of priority; Shaw, Gen. Zool., 3, 1802: 28.)

Pseudemys rugosa Barbour, List of Ant. Rept. and Amphib., Zoologica, (4) 11, 1930: 116. (Stahl is given as the authority by Barbour, although his citation was as late as 1882.)

The range usually given for this terrapin is Cuba, Jamaica, the islands of Haiti and Porto Rico. The specimen we have selected as typical of

[1] Alternative name *Pseudemys palustris* (Gmelin).

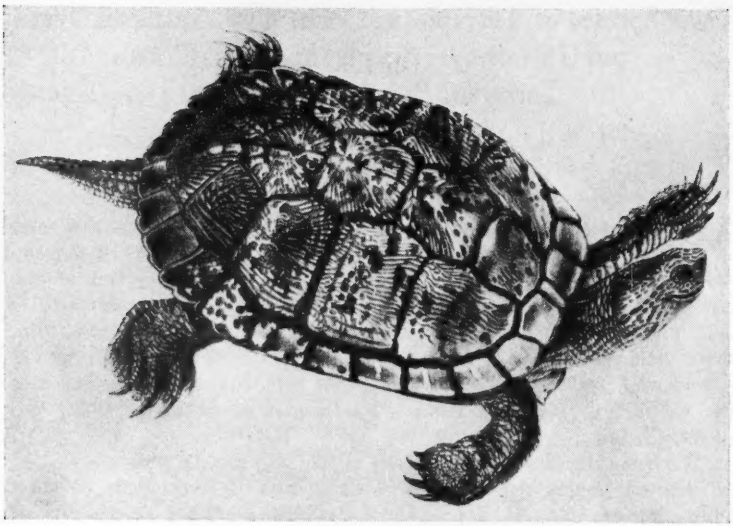

Fig. 1.—*Pseudemys rugosa.* From Sowerby and Lear. Pl. 42.

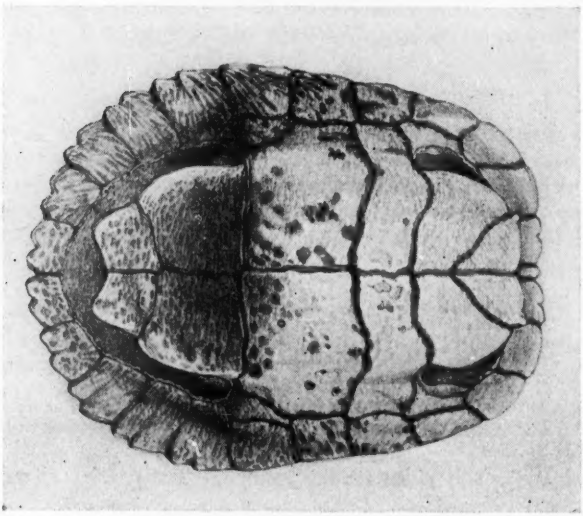

Fig. 2.—*Pseudemys rugosa.* From Sowerby and Lear. Pl. 43.

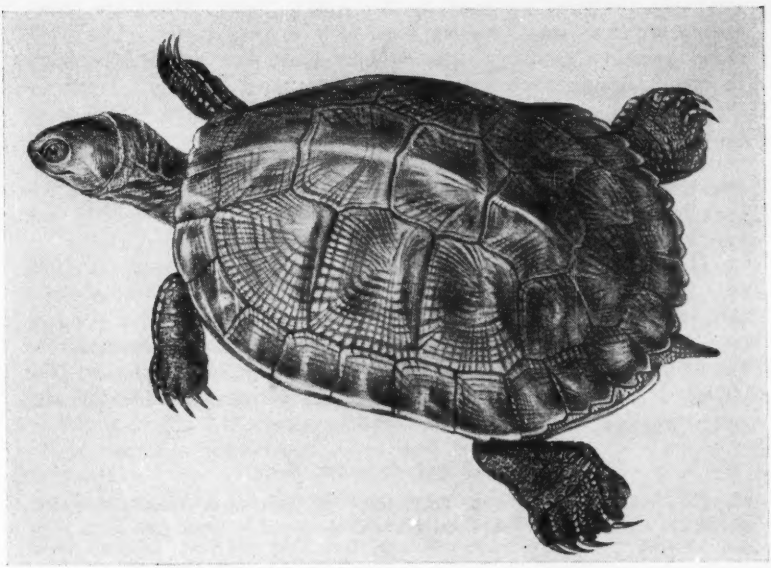

Fig. 3.—*Pseudemys decussata.* From Sowerby and Lear. Pl. 39.

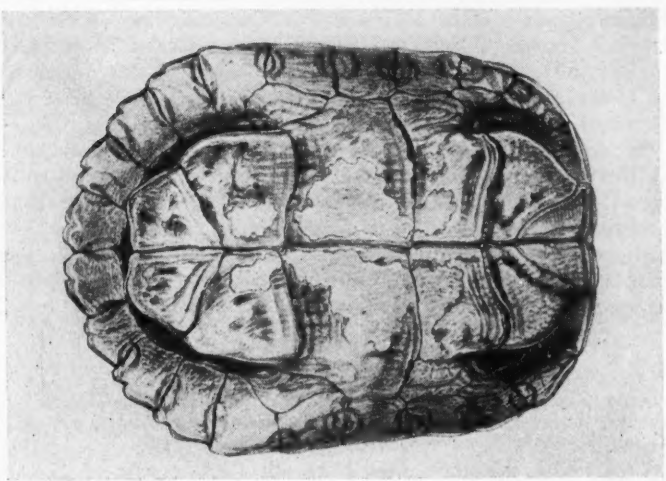

Fig. 4.—*Pseudemys decussata.* From Sowerby and Lear. Pl. 40.

rugosa is American Museum No. 44876, an adult male. This and consecutively numbered specimens to No. 44872 (Amer. Mus.) are males, a deep brown in color, ranging from olive to pale shades. The shield markings and the markings of the head and limbs show a distinct reticulate pattern. The plastron repeats the reticulate pattern, but to a lesser degree, and in some specimens (Amer. Mus. Nos. 44881 and 44882) tends to be nearly immaculate. In all the specimens the plastral sutures are filled and edged with the dominant brown color of the carapace. The shields are heavily rugose in all specimens. An excellent figure of this terrapin is to be found in color on plates 42 and 43 of Sowerby and Lear's *Tortoises, Terrapins and Turtles,* delineated as *Emys rugosa.*

These specimens were taken from February 16 to April 20, 1930, near Martí and the adjacent town of Cuatro Caminos. Most of them were found aestivating in a submerged hole in the side of a pond or *arroyo.* The first rain of the year was on April 14, and this marked the end of the dry Cuban "winter" when few terrapins are abroad. The largest, a male, measured 224x157 mm. on the carapace, and 184x121 mm. on the plastron.

Pseudemys decussata Gray

Emys decussata Gray, Syn. Rept., 1831: 28; Bell, Mon. Testud., 1836-1842: pls. 28-29; de la Sagra, Hist. Cuba, Rept., 1843: pls. 1-2; Gray, Cat. Tort. Croc. and Amphisb., 1844: 24; Sowerby and Lear, Tort. Terr. and Turt., 1872: pls. 39-40.

Pseudemys decussata Gray, Cat. Sh. Rept., Suppl., 1856: 47.

Clemmys decussata Peters, Monatsber. Akad. Wiss. Berl., 1876: 705; Gundlach, Anal. Soc. Espan. Hist. Nat., 10, 1881: 307; Strauch, Mem. Acad. Sci. St. Petersb., 38, No. 2, 1890: 78.

Range only known as Rio Tana and Rio Jobabo in Province of Camagüey, Cuba. Taken in Finca Palo Quemado near Martí in this province. Numbers 44869-71, 44877-80 (Amer. Mus.), 58 (field number, Greenhall), 70984-70991 (Mus. Zool., Univ. Mich.). The specimens in the American Museum were taken in 1930, while those of the Museum of Zoology were collected from July 6 to August 13, 1931. All the specimens in this group agree with the original description of Gray that adequately differentiates *P. decussata* from *P. rugosa.* He wrote of *decussata*: "Shell oblong, pale brown, shields rugulose, beneath yellowish with subocellated spots on the sutures of the marginal plates, animal greenish." A typical example of this species is figured in Sowerby and Lear on plates 39 and 40 as *Emys decussata.* The dimensions of these specimens are similar to those given for *rugosa.*

Key to the Cuban Species of Pseudemys

1. Plastral sutures edged and filled with brown; head, limbs, and shields having reticulate markings; carapace olive-green; shields heavily rugose; sub-marginal shields immaculate or repeating the pattern of the carapace.....*P. rugosa*
2. Plastral sutures immaculate; head, limbs, and shields a solid color; carapace olive-brown; shields almost smooth; sub-marginal shields having sub-ocellated spots on the dividing sutures .....*P. decussata*

Sexes

Some confusion has been caused by a failure on the part of many to recognize the sex characters present in *Pseudemys*. For example, several Cuban naturalists, who believed in the presence of two species on their island, offered by way of proof a male and a female of the same species. The dimorphism mislead them to consider these specimens as separate species. This type of error is also encountered in our own country, so the following key may not be amiss.

Ridge of carapace following an even curve, nails of fore-feet elongated, tail thickened basally and long .....Male
Ridge of carapace depressed posteriorly, nails of fore-feet short and stubby, tail thin basally and short .....Female

Summary

Thus we believe two types of terrapin are found in Cuba, *Pseudemys rugosa* and *Pseudemys decussata*. The former is widespread in distribution: it is known from all of the Greater Antilles except Porto Rico where a congener, *Pseudemys stejnegeri*, is found. As far as we know, *P. decussata* is restricted to Cuba, and is common in the Province of Camagüey.

In comparing the *Pseudemys* material at the American Museum, the following "no data" specimens appeared: 45088, 24191 and 24192. These were carefully examined and found to differ considerably from the two forms under consideration. They resembled some live specimens from Porto Rico seen by the senior author in the Gardens of the Jamaica Institute at Kingston, and followed Schmidt's description of *Pseudemys stejnegeri* in all essentials.

Undoubtedly further researches and the collection of material from the West Indies will show that each major island has its own species in addition to the far ranging *P. rugosa* of the Antilles.

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The Status of *Bufo copei*

By Helen T. Gaige

BUFO COPEI, described from James Bay by Henshaw and Yarrow (*Ann. Rept. upon the Geogr. Surv. Terr. of the U. S. west of the 100th Mer.*, 1878: 207-208), was later synonymized with *Bufo lentiginosus americanus* by Cope (*Bull. U. S. Nat. Mus.*, 34, 1889: 284-288) and has either been considered as a synonym of *B. americanus* or has been ignored by subsequent writers.

During a vacation trip to the James Bay region in August of this year, Mr. Calvin Goodrich kindly collected a series of toads (10 specimens, ranging from 10 mm. to 69 mm. in length) for us at Moose Factory. These specimens were so strikingly colored that they seemed quite distinct, so they were carefully compared with our northern Michigan and Ontario specimens of *B. americanus*.

The original description of *B. copei* is adequate, and the specimens from Moose Factory are easily recognizable as this form. The brilliant coloration, the long, narrow parotoid glands, the greater width between the cranial crests and the fact that they are nearly parallel, are the most obvious characters. The smoothness of the ventral granulation, mentioned by Henshaw and Yarrow, is evident, but it may be seasonal or due to preservation, and the hind limbs are shorter than is usual in Michigan specimens of *B. americanus*, the adpressed heel reaching the shoulder. The characters are distinct even in the smallest specimens.

An inquiry to Dr. Barbour brought forth the information that he has recently examined the type of *B. copei* in Washington, and that he and Dr. Stejneger have agreed that it is distinct. Specimens from Marion Creek, 30 miles north of North Bay, Ontario, collected by Dr. Hubbs, show evidences of intergradation between the southern Ontario toads and those from James Bay.[1] In the arrangement of the head crests, the shape of the parotoids, and the dorsal coloration, they are more nearly like *B. copei*, while the ventral coloration is that characteristic of *B. americanus*. Hence it seems evident that *copei* should be recognized as a valid subspecies, *Bufo americanus copei*.

Museum of Zoology, University of Michigan, Ann Arbor, Michigan.

[1] That the range of toads of the *americanus* type is probably continuous between Lake Nipissing and James Bay is indicated by the circumstance that Dr. Hubbs observed a specimen a mile west of Fauquier, Ontario, on August 30, 1932. Specimens from St. Mary's River in Tarentorus Township, and from the Mississagi River 4 miles below Iron Bridge, in Ontario, and from Ottawa, appear to be typical *americanus*. The range of *copei* therefore, is presumably restricted to the north.

A Description of *Notolepidomyzon utahensis*, a new Catostomid from Utah[1]

By Vasco M. Tanner

IN JUNE, 1928, the writer made a collecting trip throughout the western portion of Utah, beginning in the Raft River Mountains of Utah and Idaho, and extending southward along the Utah-Nevada state line to St. George. Special attention was paid to the fishes, amphibians and reptiles, as well as insects, and a large series was taken whenever possible.

At Veyo, Washington County, a collection of fishes was made in the Santa Clara Creek, a tributary of the Virgin River. The following three species were found to be common, as they were taken at several places along the creek: *Apocope oscula oscula* (Girard),[2] *Lepidomeda vittata* (Cope)[3], and *Notolepidomyzon utahensis*, the new species described below.

Other collections made in tributary streams of the Virgin and Colorado Rivers reveal that all of the above-mentioned species are common as they have been collected by the writer in the Harrisburg Creek, Ash Creek near Toquerville, Virgin River in Zion National Park, and the Fremont River in Garfield County, which flows into the Colorado River. The writer also collected *Apocope oscula oscula* in Mill Creek at Moab, Utah, and in a small stream tributary to the San Juan River, twenty miles southwest of Bluff, Utah, in July, 1927.

Specimens of *Lepidomeda vittata* Cope and *Notolepidomyzon utahensis* have been taken in Zion National Park by Professor A. M. Woodbury and his son, Lowell, and these have also been studied by the writer.

Notolepidomyzon **utahensis**, new species

Type locality: Santa Clara Creek, Veyo, Washington County, Utah. The type specimen (No. 1135) and nine paratypes are deposited in the Brigham Young University Vertebrate Collection. Four paratypes are in the fish collection of the Museum of Zoology, University of Michigan (No. 85952).

Description of the type: Head 4.73 times in length to base of caudal; depth 4.91; depth of caudal peduncle 11; snout 1.97 in head; dorsal rays 10; anal rays 7; scales in lateral series 100; scales before the dorsal 40.

The body is rather slender and long, head tapering, snout blunt. More than one hundred specimens studied show that the fontanelle is completely closed. Width of mouth contained 3.98 times in length of head;

[1] Contribution from the laboratories of the Department of Zoology and Entomology, Brigham Young University, No. 47.

[2] In January, 1929, Dr. Carl L. Hubbs commented to the writer in a letter as follows concerning specimens of this species which were submitted to him for study: "Your specimens of *Apocope* from the Colorado Basin are all referrable to the common form of that drainage, commonly known as *couesii* or *yarrowi*. This form, with about 70-75 scales, is connected with the coarse-scaled *carringtonii* by the intermediate form *adobe* of the Sevier Basin. It should be named *oscula* because a type examined by me has only 70 scales in the lateral line. The very fine-scaled form of the Southern Arizona Mountains, with about 80-85 (probably never 90) scales, the form called *oscula* by Jordan and Evermann, will probably have to be known under some other name, if deemed distinct enough from the true *oscula*."

In the new Jordan check list, 1930, *Apocope oscula* Girard is reported only from Lower Colorado and Gila Rivers of Arizona.

[3] This is the first time that this species has been reported from Utah.

width of mouth including lips 18 mm. Papillae, in about 4 rows on the upper lip, are of practically the same size in the inner as in the outer row; papillae in about 7 rows on lower lip, the inner ones of about same size as outer ones. Lower lip moderately cleft, with 6 rows of papillae on inner margin of cleft.

The dorsal has its origin equidistant between tip of snout and base of caudal. Caudal moderately convex, 2 in head; anal 1.17 in head; caudal peduncle short, 2.25 in body depth. Lateral line straight except for a short upward curve at its origin where it passes above the operculum. Anterior scales small, posterior scales becoming larger; 7 scales above the lateral line on the caudal peduncle.

In life the females are a gray to olive green above, becoming lighter on the venter. Some specimens are whitish while others are pinkish in color. The males are colored as the females except along the lateral band, which during the spring, in May and June, becomes reddish and very noticeable. In alcohol specimens are dusky color above, brownish white on the venter.

Comparisons: *Notolepidomyzon utahensis* is closely related to *N. clarkii* of the southern Colorado drainage, but has smaller scales, especially before the dorsal. It differs from *N. santa-anae* of southern California by having smaller scales, and fewer dorsal rays. From *delphinus* of the upper Colorado River drainage it differs in having larger scales, the caudal peduncle less contracted and the lower lip more incised.

Remarks: Specimens of *N. utahensis* have been studied by Dr. Carl L. Hubbs, who wrote "Your discovery of this form is a very valuable one. It helps to bind together into one natural group the two species of the subgenus or genus *Notolepidomyzon* occurring in the Colorado Basin, namely *clarkii* and *delphinus,* and *santa-anae* of southern California."

This species seems to be common in the streams of southwestern Utah which are tributary to the Colorado River.

MEASUREMENTS OF THE TYPE AND NINE PARATYPES OF NOTOLEPIDOMYZON UTAHENSIS, IN MILLIMETERS

All these specimens were taken in the Santa Clara Creek at Veyo, Washington Co., Utah, except No. 2349, which was collected in Zion National Park.

Numbers	1135	2302	2304	1134	1136	2306	1421	2348	2347	2349
Length of body	177	151	133	177	98	120	85	105	101	135
Length of head	37.5	35	27	38	23.5	18	21	27	25	30
Depth of body	36	34.5	27	35	23	25	20	25	23	29
Depth of caudal peduncle	16	12.5	9.5	15.3	9	10	8	10	9	11
Length of caudal peduncle	31	28.5	20	31	13.5	20	14	16	16	25
Length of snout	19	16	13	19	12	14	10.5	13.5	12.5	16
Diameter of eye	5	4.5	4	5	3.5	4.5	3	3.5	3.5	4.5
Interorbital width	17	14.5	11	16.5	9.5	11	9	11.5	10	14
Depth of head	25	21	16.5	25	15	17.5	13.5	17	15.5	20
Snout to occiput	31	27.5	21	31	20	23	19	21	20.5	26
Snout to dorsal	86	72	57	85	49	59	44	53	51	65
Snout to ventral	103	81	68	98	59	67	50	64	57.5	75
Length base of dorsal	26	18	17	22	16	20	13	16	16	20
Length base of anal	12	10.5	10	12	8	10	6.5	7	7	10
Height of dorsal	30	22	21	27	19	20	16	20	20	23
Height of anal	29	29	26	29	19	28	15	19	20	28
Length of pectoral	33	29	23	34	20	24	17	20	20	23
Length of ventral	25	22.5	19	26	15	20	3.5	16	15.5	19
Length of caudal	28	29	25	29	18	19	15	20	20.5	25
Dorsal rays	10	10	10	10	10	10	10	10	10	10
Anal rays	7	7	8	7	7	7	7	8	7	8
Scales lateral series	100	94	99	100	93	91	88	93	96	99
Scales above lateral line	17	14	16	16	14	15	14	16	16	15
Scales below lateral line	17	13	17	18	13	17	13	18	17	17
Scales before dorsal	40	31	39	38	38	36	32	33	34	38

BRIGHAM YOUNG UNIVERSITY, PROVO, UTAH.

Notes on Colombian Fresh-water Fishes, with Description of a New *Astroblepus*

By GEORGE S. MYERS

A FURTHER collection of fishes from Colombia,[1] sent to me for determination by Brother Nicéforo Maria, of the Instituto de La Salle in Bogotá, contains some interesting species, of which several deserve recording. An unexpected discovery was a fine new *Astroblepus* from Antioquia.

1. *Curimatus metae* Eigenmann

One, 90 mm., Guaicaramo, Rio Upia, Upper Meta basin. This species has not been reported since it was described in 1922.

2. *Leporinus y-ophorus* Eigenmann

One, 130 mm., from Guaicaramo; the second known specimen.

3. *Astyanax integer* Myers

A second specimen of this species, 86 mm., from the type locality, Guaicaramo. A third, 84 mm., labeled as from the Magdalena River, across the Eastern Andes, is a most surprising record. These specimens only serve to emphasize the distinctness of this species.

4. *Astyanax fasciatus* (Cuvier)

A single specimen, 49 mm., from Cucutá, in the Lake Maracaibo drainage. It may be that this represents *Tetragonopterus viejita* Cuvier and Valenciennes (*Hist. Nat. Poiss.*, 22, 1849: 154). Eigenmann (*Mem. Mus. Comp. Zool.*, 43, 1921: 293, footnote 1) gives notes on what he considered to be the type specimen in the Paris Museum, but examination of the original description of *viejita* makes it plain that the type is the specimen from Maracaibo collected by Plée and not the one from "Brésil méridionale" examined by Eigenmann.

5. *Corydoras melanotaenia* Regan

One from Guaicaramo, 40 mm.

6. *Astroblepus longifilis* (Steindachner)

Two fine specimens, one, 110 mm., from a stream tributary to the Rio Cauca at Jericó, west of Medellín, Antioquia, and the other, 76 mm., from Fusagasugá, south of Bogotá, Cundinamarca.

7. *Astroblepus grixalvii* Humboldt

One, 60 mm., from Choachi, east of Bogotá, on the Atlantic side of the crest.

8. *Astroblepus* **nicéfori**, new species

Holotype.—No. 24796 Stanford Univ., Sonsón, Antioquia, Colombia. D. I, 6; A. I, 5½; P. I, 9½; V. I, 4; C. I, 11, I.

[1] For a report on a former collection, see *Proc. Biol. Soc. Wash.*, 43, 1930: 65-72.

Adipose fin very low, little developed, originating over origin of anal fin; a short soft prominence which may represent a rudimentary spine near the posterior end. Teeth of outer series of each premaxillary bicuspid incisors with truncate tips, the teeth toward each side losing the central notch and assuming an obliquely truncated form. Three inner rows of sharp bicuspid teeth. Mandibular teeth larger and rather truncate-bicuspid in form. Nostrils with a wide squarish flap, not prolonged into a barbel.

Pelvic fins originate under first dorsal spine, extending nearly to anus. Pectoral spines with a short filament, reaching middle of pelvics. Tip of dorsal spine scarcely filamentous. Top and sides of head and dorsum, from eyes to dorsal fin, coarsely and conspicuously granulose with soft rounded tubercles. Maxillary barbels do not quite reach gill opening.

Light brownish, mottled with dark. Dorsal and caudal rays spotted, the spots much fainter on anal and pectorals. Pelvics light.

Measurements in millimeters

Standard length, 57.

Total length	72.	Depth caudal peduncle (without adipose)	6.
Head length	15.	Snout tip to dorsal origin	22.5
Greatest breadth of head	14.	Snout tip to anal origin	41.5
Interocular	3.	Snout tip to eye	8.
Depth at dorsal origin	9.	Eye to posterior nostril	4.5
Length caudal peduncle	9.5		
Length dorsal spine	13.		

Besides the type there is a single paratype in poor condition, 70 mm. in standard length. The paratype has not been utilized in the description.

This species differs from *A. simonsi* Regan (*Trans. Zool. Soc. London,* 17, 1904: 317, pl. 21, fig. 9) particularly in the bifid mandibular teeth, the more posterior dorsal, and the lower adipose fin; from *A. fissidens* Regan (*tom. cit*: 316) in the more truncate teeth, the longer head, and the much more posterior dorsal; from *A. festae* Boulenger (Regan, *tom. cit*: 316, pl. 21, fig. 7), to which it is closest, in the lack of a nasal barbel, in the more posterior nostrils and in the larger and less filamentous pelvics; from *A. peruanus* Steindachner (*Sitzungsb. Akad. Wiss. Wien,* 72, Bd. 1, 1875: 601, pl. 9, fig. 3-6) in the deeply notched mandibulary teeth, the longer maxillary barbels, the better developed adipose fin, and the shorter pectorals and pelvics; and from *A. heterodon* Regan (*Proc. Zool. Soc. London,* 1907 (1908): 799, pl. 49, fig. 2) in the much more elongate form.

9. *Allopoecilia caucana* (Steindachner)

A male and two females of this interesting species, from Cucutá, Santander del Norte, where it is used against mosquito larvae. This extends the range into the Maracaibo drainage, but we do not know whether or not the species has been introduced there.

Natural History Museum, Stanford University, California.

Five New Philippine Fishes

By Albert W. C. T. Herre

In working over the very extensive collections made by me in the Philippine Islands in 1931, I have found many fishes new to the Philippines, and also a number of new species. Five of the latter are here presented. The types are deposited in the zoological museum of Leland Stanford Junior University. In a later paper will be presented a number of species known only from Bleeker's types or otherwise notable for their rarity.

1. *Callechelys* **myersi**, new species

This very elongate, whip-like eel differs primarily from the other members of the genus in having at the posterior margin of each gill opening a broad short growth which is evidently the basal portion of an undeveloped pectoral. It is very small and easily overlooked, but contains two very short rays and its nature is very readily apparent, once it is seen.

The depth of the trunk is 78.8 times, that of the much inflated posterior portion of the head 57.5 times in the length; the head is 21.8 times in the total length, 10.16 times in the trunk; the tail is a little longer than the trunk, and is contained 1.04 times in the head and trunk together; the very small eye is 36 times in the head, 3.5 times in the snout; the cleft of the mouth is 5 1/7 times in the head; the anterior nostrils are in a very short broad tube; the posterior nostrils are in a triangular tube-like flap just before a vertical from the front margin of the eye; between the nostrils is a small triangular flap; the dorsal is of moderate height and begins far behind the mouth on the posterior half of the head, four-ninths of the head length before the gill opening. The teeth in the jaws are small, close-set, pointed, in one row; on the intermaxillary is a row of 3 minute teeth covered with skin and hidden from sight; the dorsal and anal extend practically to the caudal tip, only a minute portion of the apex of the tail being free.

The color in alcohol is yellowish white, with a broad brown longitudinal band covering the upper three-fourths of each side; the head is black to bluish dusky with a white ocular cross band over the top of the head; on the rear half of the head are two white transverse lines; each pore of the lateral line is in a conspicuous white spot; the dorsal is pure white, as is the anal also.

Here described from the type and only specimen, 788 mm. long, collected by me at that rendezvous for rare eels, Dumaguete, Oriental Negros, Philippine Islands.

On comparison with a specimen of *Callechelys melanotaenia*, to which this species is nearest, the differences are numerous. The rudimentary pectoral, the teeth, the tiny eye, the color markings, the pure white dorsal without a blackish or dusky margin, and the great difference in the length of the tail, all serve to distinguish this species.

I take pleasure in naming it for Mr. George S. Myers, who first noted the vestigial pectoral.

2. *Barbodes* ***disa***, new species

Dorsal IV-8; anal III-5; pectoral I-13 or 14; ventral I-7 or 8; there are 12 predorsal scales, 30 scales in the lateral line plus 2 more on the caudal base, 5½ above and 4½ below the lateral line; there are 14 scales on the caudal peduncle and 3 between the ventral origin and the lateral line.

The depth of the elongate compressed body is 3.8 to 3.96 times, the head 3.8 to 3.9 times in the length; the eye is 4 times, the snout 3.4 to 3.5 times, the interorbital 3.1 to 3.6 times in the head; the oblique mouth is terminal, with weak jaws, the lower jaw included; the maxillary does not quite reach a vertical from the front margin of the eye; the small, slender barbels are about half an eye diameter in length; the dorsal origin is opposite the tenth scale of the lateral line and is a trifle anterior to the ventral origin, which is opposite the posterior part of the tenth scale; the height of the fourth dorsal spine equals the length of the pectoral, and is approximately five-sevenths of the head; the bony portion of the fourth dorsal spine is serrated behind and is three-fourths to four-fifths of the entire height of the ray; the pectoral fails to reach the ventral base by the breadth of two scales and the ventral falls much short of reaching the anus; the least depth of the caudal peduncle is 3.55 to 3.66 times in its own length or 2.38 to 2.44 times in the head; the deeply forked caudal is a trifle more or less than the head.

The color in alcohol is dusky above, becoming whitish yellow beneath, with a broad blackish stripe from the opercular angle to the middle of the caudal base and a blackish transverse band midway between the first dorsal and the nape, connecting the two lateral stripes; the ventrals and anal are yellowish, the other fins more or less dusky.

Here described from the type, 82 mm. long, and the paratype 81 mm. long, purchased in the market at Dansalan, Lanao, the specimens coming from Lake Lanao.

Disa is the Marinão name.

3. *Barbodes* ***sirang***, new species

Dorsal IV-8; anal III-5; pectoral I-14; ventral I-8; there are 24, rarely 25 or 26, scales in the lateral line plus 2 or 3 more on the caudal base, 4½ above and 3 below the lateral line; there are 8, or sometimes 9, predorsal scales and 11 on the caudal peduncle; there are 3½ scales between the ventral origin and the lateral line; there are no elongate axillary scales.

The oblong body is only moderately elevated but the rounded belly is usually protuberant and broad; the upper profile of the head descends in a straight line to the more or less pointed snout which has a terminal hump; the depth is usually 3 times in the length, rarely 3.25; the head is about 3.25 times in the length; the eye is 3.5 to 4.5 times in the head, equal to or less than the snout which is 3.5 to 3.6 times in the head; the eye is very close to or projects above the dorsal profile of the head; the posterior margin of the eye is midway of the length of the head; the terminal mouth is of moderate size, the lower jaw included, the maxillary extending beneath the anterior margin of the eye; the small and inconspicuous barbels rarely equal the eye, usually varying from little more than half to three-fourths

an eye diameter in length; in adults the free margin of the dorsal is emarginate; the dorsal origin is a little in advance of the middle point between the tip of the snout and the caudal base and is opposite the ninth scale of the lateral line; the fourth dorsal spine is of moderate size, much shorter than the head, its hind edge minutely serrate; the ventral origin is opposite the base of the second or third dorsal ray and opposite the tenth lateral line scale; the deeply forked caudal is a little shorter than the head; the least depth of the caudal peduncle is 3.4 times in its own length; the length of the ventral is twice in that of the head and extends nearly to the anus except in spawning females, in which it may fall short by more than a scale breadth; the short pectoral is about 1.7 times in the head and does not extend to the ventral origin by one or two scales; the lateral line is slightly curved downward but does not rise to the middle of the caudal peduncle until the third or fourth scale before the caudal.

In life the color is dusky to blackish bronze above, the sides silvery dusky, and gray to whitish below, or the entire fish may appear black with metallic bronze or silver sheen; the dorsal, caudal, and pectoral are dusky or blackish, the other fins colorless.

In alcohol the color is blackish above, shading to brown or yellowish below; the dorsal, pectorals and caudal are more or less dusky, the other fins pale. Some specimens lose all their blackish hue.

Here described from the type, 59 mm. long, and 24 paratypes, 40 to 61 mm. long; the majority of the specimens are females distended with eggs. This species is sexually mature when 40 mm. long, and does not attain a size larger than given above.

This species is markedly different in appearance from any others of Lake Lanao, and when just drawn from the water appears entirely black with bronze or silvery reflections. It is little valued by the natives.

B. sirang is obtained in large quantities near Lumbatan on the south shore of Lake Lanao, and in varying amounts near Dansalan on the north side of the lake.

I obtained a fine series at Lumbatan, along with many other Cyprinidae, which were packed in fruit jars for shipment. Unfortunately the jar containing my specimens of *B. sirang* was broken(all the others coming through intact) and many dried up and had to be thrown away.

Sirang is the Marinão name.

4. *Micrognathus* **magdamoi,** new species

Dorsal 15 or 16; anal 2; pectoral 11; caudal 9; there are 14 trunk rings and 33 to 35 in the tail; the dorsal is on the last trunk ring and the first three caudal rings.

The depth of the slender elongate body is 28 to almost 30 times in the length; the trunk is heptagonal, the tail four sided, and all the angles are smooth; the head is 12.9 to 13.5 times in the length; the eye is 3.85 to 4.25 times, the snout 3.35 to 3.7 times, the postorbital portion of the head 2 to 2.1 times, the caudal 2.8 times in the head; the short blunt snout has a high median longitudinal crest, and there is a low median longitudinal ridge on the nape; there is a bony ridge above the eye, and behind it above the center of the eye is a small tentacle, very slender and simple in the fe-

male, stouter and branched in the male; there are no other cutaneous appendages; a very short keel may be present on the opercle, or it may be obsolete on one side; there are no radiating lines on the opercle; the pectoral equals the eye; the trunk is 2.2 to 2.38 times in the tail, which is nearly two-thirds of the total length; the anal is minute.

The color of a female in alcohol is pale grayish brown, becoming much lighter beneath, the muzzle white, with some whitish flecks on the sides of the head; a male is similarly colored, but the pale color of the under side forms numerous rings encircling the body.

Here described from the type, a male 110 mm. long, carrying many eyed embryos, and a female paratype 115 mm. long, collected by me at Dumaguete, Oriental Negros, Philippine Islands.

This species is close to *M. mataafae* (Jordan and Seale) but differs in having 15 or 16 instead of 21 to 23 dorsal rays, in the different character of the crest on the snout, in the character of the operculum, in the proportions and other details.

I take pleasure in naming this for Prof. Magdamo, assistant professor of biology at Silliman Institute, Dumaguete.

5. *Macropharyngodon* **negrosensis**, new species

Dorsal IX-11; anal III-11; there are 27 scales in the lateral line, plus 2 more on the caudal base, 3 above and 11 below the line.

The body is strongly compressed, the depth 2.75 times, the head 3 times in the length; the short snout is 3.1 times, the eye 5.6 times, the rounded interorbital 3.875 times in the head; the mouth is small, terminal, horizontal, the maxillary extending beneath the posterior nostril; there are four caniniform teeth at the front of each jaw, the posterior pair in the upper jaw turned backward; there is a prominent downward-pointing posterior canine at the angle of the upper jaw on each side; the dorsal spines are soft and flexible, the posterior one 3.6 times in the head; the dorsal and anal are both pointed behind; the first ventral ray is elongate, reaching the anal origin, and is contained 1.5 times in the head; the broad pectoral is a trifle shorter than the ventrals; the caudal is truncate, 1.5 times in the head; the least depth of the caudal peduncle is twice in the head; the large molariform pharyngeal teeth are typical of the genus; the scales on the breast are noticeably smaller than those elsewhere.

The color in alcohol is purplish black everywhere, except for a faint pale edge to the dorsal, the yellowish translucent pectorals, and a conspicuous yellowish white center to the caudal; this noticeable white caudal patch is broadly margined above, below, and behind with deep black, with square cut corners posteriorly; across it are 3 faint darker bars.

Here described from the type and only specimen, 94 mm. long, collected by me at Dumaguete, Oriental Negros, Philippine Islands.

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The Eggs and Nesting Habits of the Crested Blenny, *Anoplarchus*[1]

By Leonard P. Schultz and Allan C. DeLacy

FOR nearly a half century the eggs and nesting habits of *Blennius gunnellus* L., the butter fish of the North Atlantic, have been known. Smith (1886 and 1887) published the first accounts, and many other publications have followed in recent years. The breeding habits of the blennies in other regions seem to have been neglected. A review of the available literature shows but one reference to this subject in South Africa (Gilchrist and Thompson 1910), and one reference in the North Pacific region, that by Metz. The latter author (1912: 57) states in regard to *Xerepes fucorum*: "One specimen was found coiled around a mass of eggs placed in a small depression in the rock, and well concealed by the matted grass above. The figure [referring to Plate II, fig. D., p. 63] shows a photograph of the egg mass with the fish around it, (not in situ)." This specimen was probably seen in July. Dr. Hubbs tells us that he once found an adult of *Cebidichthys violaceus* in a crevice, coiled about its large mass of eggs. Because of this scanty information on the breeding habits of blennies in the North Pacific it seems desirable to describe the nest of the crested blenny, *Anoplarchus purpurescens purpurescens* Gill, as found at Seattle, Washington.

A typical crested blenny habitat occurs at Lincoln Park, in Seattle. The beach here is composed of loose stones which range in size up to seven inches. The larger stones have become partly embedded in the bottom because the wave action is not strong enough to shift them from place to place. By turning over loose stones near the water's edge during any minus tide, numerous blennies will be seen. The larger spaces under the more loosely associated stones are occupied by crabs; and the blennies occur among the crevices of the more closely fitting stones, but the two are seldom found together under the same stone. *Anoplarchus purpurescens purpurescens,* a robust dark-colored form, is much less active when disturbed than the more slender species, as *Pholis ornatus* and *Pholis laetus. Epigeichthys atropurpureus* and *Oligocottus maculosus* rarely are found under the stones here, but *Caularchus maeandricus,* the cling-fish, is very common.

On February 27 we observed at the Lincoln Park beach that certain individuals of the crested blenny had their abdomens greatly distended with eggs. The two sexes of *Anoplarchus* were colored differently: the anal fin of the male was bright red to scarlet, that of the female dull gray; the back along the dorsal fin of the male was plain grayish to black, that of the female showed distinct grayish white blotches. Females with ripe eggs and males in breeding colors occurred under the same group of stones. This caused us to look carefully for nests. After turning over many stones, a single cluster of eggs of the crested blenny was found at about the mean low tidal level. This nest of eggs occurred under a 6-inch stone, supported on each side by smaller stones. The bottom was composed of small pebbles

[1] Paper presented at the 1932 meeting of the Western Division.

and stones, shells, and fragments of shells, mixed in a firm layer of sand. The egg mass measured 14 mm. in height, 20 mm. in diameter at the top, 17 mm. across the center, and 27 mm. in diameter at the bottom. A groove extended around the middle of the cluster, undoubtedly representing the imprint of one of the parent's bodies. The imprint of the stone above and the bottom below showed clearly on the cluster of eggs. The female was taken with the eggs and the male was found a few inches away, but he escaped capture. These eggs were freshly laid, since on the following day the development had progressed only to the early formation of the primitive streak. We incubated the eggs at 8°C. for two weeks in small finger bowls at the laboratory. The water circulating around the finger bowls to keep the eggs cool, was shut off one night by accident. This allowed the temperature to reach 18°C., and caused all the embryos, which were nearly ready to hatch, to perish.

Three other clusters of eggs were found at Lincoln Park beach on March 26th. The temperature of the sea water on this date was 8°C. One of these clusters measured about 18 mm. in height, 19 mm. in diameter at the top, 16 mm. in diameter at the center and 28 mm. across the bottom. As in the former cluster, a groove extended around the middle of the cluster. This group of eggs occurred under an oblong rock 5 by 7 inches, which was supported by smaller stones. The female on guard was partly coiled around the eggs. Another cluster was flattened and a deep groove, 10 mm. in width, extended across the upper side. The greatest thickness at one side of the groove was 13 mm. and at the other side 9 mm.; the least depth in the middle of the groove measured 4 mm. The egg mass was deposited directly on the sandy bottom. It was covered by a flat stone, above which were larger stones.

The fourth group of eggs, measuring 33 mm. across the bottom, 18 mm. in diameter at the top, and 16 mm. in thickness had been laid in a 60 by 73 mm. right valve of *Saxidomus giganteus*. This shell was covered by a stone and the female was guarding the nest as in the other cases. The cluster of eggs conformed to the shape of the clam shell below, and the rock above. Gudger (1927) and Ehrenbaum (1904) report the finding of the eggs of *Pholis gunnellus* in oyster shells and in the burrows of *Pholas*. Lebour (1927), studying the nesting habits of *Blennius pholis* states that the eggs are found between tide marks on the under surface of flat stones in small rock pools and in deep crannies only accessible by some narrow crack through which the fish can squeeze and be safe from enemies.

Among the many specimens of *Anoplarchus* brought back to the laboratory and kept in aquaria, but a single female laid her eggs. These eggs were in the form of an ovate globular mass, but without a groove as noticed in nature. They were not fertilized.

The eggs adhere loosely to the stones among which they are laid, but stick firmly to each other. The size of the cluster depends on the number of eggs deposited and how firmly they are packed together. The eggs are white when freshly laid but after a few days become grayish. From one to three oil globules are present in the newly laid eggs. The older eggs always contain one large oil globule and sometimes an additional small one. The oil globule, measuring .326 to .409 mm., is pale yellowish. It floats

upward so that the head of the developing embryo is downward. The oil globules of *Blennius pholis* are bright yellow (McIntosh 1903). Cunningham (1889-1890) states that the yolk in *Blennius ocellarius* is orange red.

Measurements of the eggs of the crested blenny were made with a filar micrometer eye piece and the results recorded in Table 1. The fertilized egg has a diameter of 1.367 to 1.492 (average 1.441) mm. The perivitelline space is about .5 mm. in width. These eggs are about the same size as those of *Blennius pholis* as reported by McIntosh (1903), but smaller than the eggs of *Pholis gunnellus* which are about 2 mm. in diameter (Gudger 1927). Lebour (1927) states that the eggs of *Blennius pholis* are 1.4 mm. in diameter. The diameters of unspawned eggs, Table 1, average about the same as the yolk material of the fertilized eggs. The naturally spawned but infertile eggs were a little smaller than the fertile eggs.

TABLE 1. DIAMETER FREQUENCIES OF THE EGGS OF THE CRESTED BLENNY

Diameter in millimeters	Eggs removed from ovaries	Eggs deposited naturally			
		Fertilized			Infertile
		Total diameter	Diam. of yolk plus developing embryo	Diameter of oil globule	Total diameter
.326- .346	—	—	—	1	—
.347- .367	—	—	—	3	—
.368- .388	—	—	—	5	—
.389- .409	—	—	—	2	—
.693- .734	2	—	—	—	—
.735- .776	2	—	—	—	—
.777- .818	11	—	—	—	—
.819- .860	11	—	1	—	—
.861- .902	5	—	8	—	—
.903- .944	4	—	8	—	—
.945- .986	4	—	1	—	—
.987-1.028	2	—	3	—	—
1.029-1.070	—	—	1	—	—
1.071-1.112	1	—	—	—	—
1.304-1.324	—	—	—	—	2
1.325-1.345	—	—	—	—	4
1.346-1.366	—	—	—	—	4
1.367-1.387	—	1	—	—	3
1.388-1.408	—	2	—	—	1
1.409-1.429	—	3	—	—	—
1.430-1.450	—	8	—	—	—
1.451-1.471	—	6	—	—	—
1.472-1.492	—	2	—	—	—

The females found guarding each of the egg clusters were brought back to the laboratory and carefully studied. A microscopical examination showed that the ovaries were shrunken and contained no large ova. Only small microscopical ova were present, which probably were the potential eggs of the next spawning. The standard lengths of the guarding females were 82, 89 and 101 mm., about the same size as the unspawned individuals taken on February 27, which contained ripe eggs.

The sex of the parent guarding the nest of the crested blenny appears to differ from certain Atlantic species. The males of the following species

have been reported to guard the nest: *Blennius sphynx* and *Blennius montagui* (Guitel 1893), *Clinus argentatus* (Guitel 1892) and *Blennius gattorugine* (Brown 1929). Gudger (1927) reports that both sexes guard the eggs of *Pholis gunnellus*.

An examination of the stomachs of the guarding females revealed no food. A piece of brown algae, 45 mm. in length, was observed in the intestine of one individual. Probably the guarding parent does not take food during the period of parental care unless some is washed in very close to her.

TABLE 2. THE NUMBER OF RIPE OVA IN THE CRESTED BLENNY

Length of fish in millimeters	Number of eggs per fish
101	3022
100	1990
87	1511
85	1315
78	828
77	1014

The fecundity of the crested blenny is indicated in Table 2, in which are given the number of ripe eggs counted in the ovaries of 6 unspawned females. In general the longer the fish the greater the number of eggs. Gudger (1927) reports only 686 eggs in a mass laid by *Pholis gunnellus*. *Anoplarchus* deposits a larger number of eggs.

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A Preliminary Study of Population Stability and Sex Ratio of *Lebistes*[1]

By C. M. Breder, Jr., and C. W. Coates

IN STUDIES involving a consideration of the various biological equilibria inherent in so-called balanced aquaria, it became desirable to consider the statistical characteristics of the populations of fishes which form the centers of such microcosms. For purely practical reasons, *Lebistes reticulatus* Peters was selected as a suitable fish for such a study. The data discussed herewith represent the early results of this series of experiments. The aquaria are still under statistical observation and will be reported on more fully at a later time.

Experiments

All experiments were carried out in identical aquaria, measuring 10″ ×8″×6″, and holding 5.5 liters of water. The temperature was held at 25.5°C±4°. Light and other conditions were maintained as uniform as possible. Any fluctuations that may have been inadvertently introduced were of identical nature in each aquarium and consequently of little significance in the final readings.

Experiment No. 1

Two aquaria were stocked as follows:

A. One gravid female.

B. Fifty mixed specimens (approximately 1/3 male, 1/3 female and 1/3 immature of various sizes).

Accurate counts were made of the numbers surviving at weekly intervals. These data are given in Table 1. After eleven weeks had elapsed, it was considered desirable to obtain some measure of the mass of living fish material supported in each aquarium. For this purpose a device was

[1] Paper presented at the Washington meeting of the Society, May 6, 1932.

so designed as to measure the total volume of the fishes in cc, with a minimum of handling (Breder and Coates, 1932). The success of this piece of apparatus may be judged by the fact that no complications arose after its use, nor could any fatalities be traced to it. The inherent error in these readings is less than $\pm 1\%$ of the average reading. The data of these readings are also given in Table 1.

Experiment No. 2

In connection with another problem not to be discussed herewith, four virgin females were mated, each once. Their successive broods were counted and reared separately. The average of the four is given in Table 2. The broods averaged 28.3 days apart. The offspring of these and other fishes averaged 1 male to 2 females. The average time from birth to the first brood was 82.75 days.

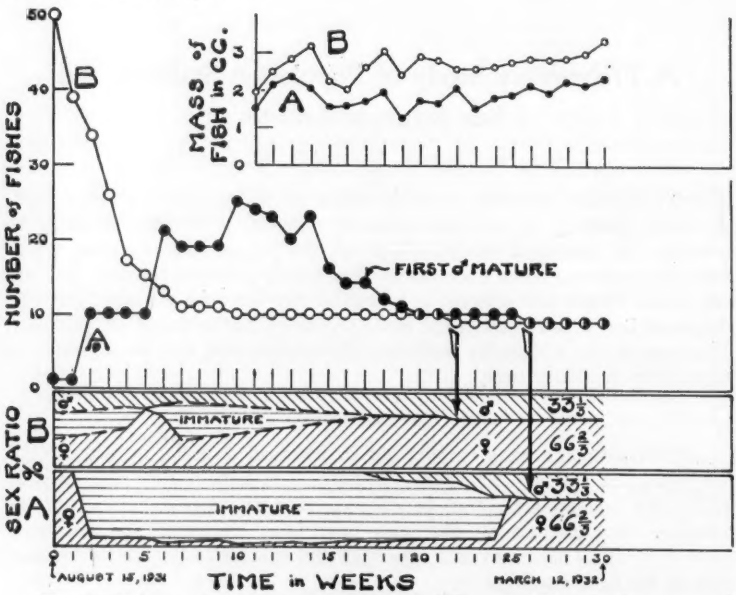

Fig. 1.—Primary data of aquaria "A" and "B": population density, mass of fish and sex ratios. The two vertical arrows indicate the points at which both numbers and sex ratio reached a static condition.

Experiment No. 3

Another tank used in bacteriophage studies (Breder, 1931), which was started with two pairs of fish and here designated tank "C," was counted and measured volumetrically as a check on experiment No. 1. These data are given in Table 1.

Discussion

In experiment No. 1 tank "B" was purposely overcrowded (as based on general experience) but not to the point of respiratory difficulties. The

fate of the excess fishes in this aquarium was their rapid elimination. The condition is shown by a remarkably smooth curve (Figure 1) which is directly referable to the totality of effects involved in "population pressure." No newly born fishes survived, and so active was the cannibalism of the adults that none was ever seen. Consequently the 9 fishes remaining after the curve had reached its asymptotic value, were all survivors of the original, artificially overcrowded stock. Starvation was removed as a possible cause of death, by means of always presenting an excess of food, so that the fishes were uniformly gorged. That young fish were actually produced was evident from the noticeable, sudden collapse of obviously gravid females. This effect is reflected in the volumetric data of Figure 1. The fishes that died were without symptom of disease, injury, or other tangible effect.

Tank "A" on the other hand was built up from a single gravid female. Consequently, this experiment is the actual history of one female and her

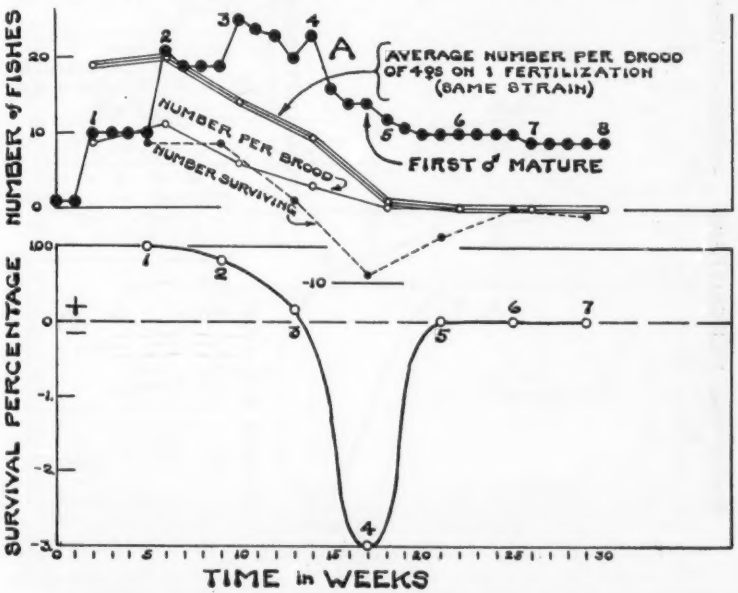

Fig. 2.—The survival percentage of newly born fish in aquarium "A" compared with the birth rates of four other females.

family. Her successive broods built up the population until a high point of 25 was reached, where it began to fall off until the level of tank "B" was reached. This point was at a slightly later time, as the population in tank "A", based on the broods of a single female instead of a large mixed population, got away to a slower start. It will be noted that these two curves are very good fits with the theoretical logistic curves of population. The lower limb naturally has a "hump" not ordinarily present, as in this special case we are dealing with a single female producing relatively large

broods about every 28 days. If *Lebistes* produced one young every one or two days, there is every reason to suppose that the curve would simply reach 9 from below and not exceed it at any time. The upper limb of the logistic curve (in a non-suicidal culture, at least) has not been experimentally demonstrated before this, coincidentally with the lower, so far as we know; certainly not in vertebrates. The "hump" in the lower limb of the curve led to an inquiry into the effect of the total mass of metabolizing tissue. The curve of "A" upward and "B" downward, suggested the effect of an upper limit of so many cc's of fish, not of so many individuals.

Before discussing this, however, a digression must be made into a consideration of the fate of the young born into various population concentrations and into the sex ratio of a stable population. Figure 1 shows the shift in percentages of the sexes of the mature fish and of the immature

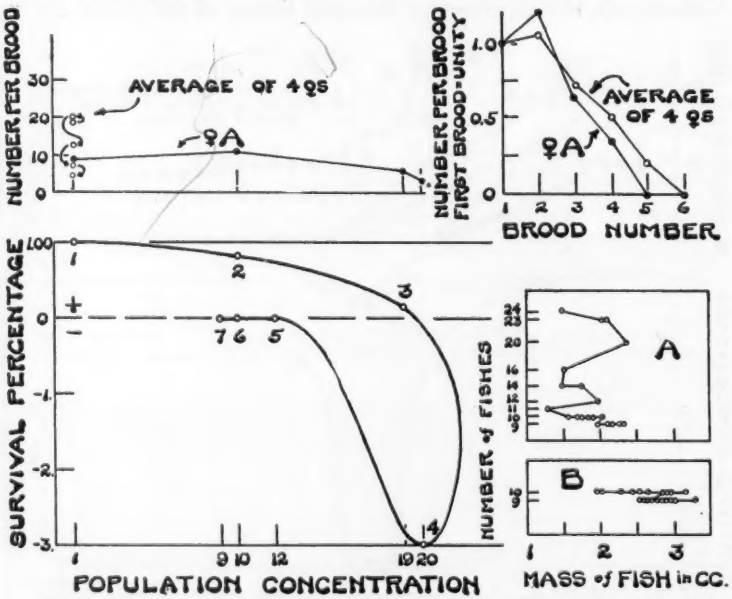

Fig. 3.—Comparison of survival percentage of newly born fish with population concentration in aquarium "A." Also mass of fish in aquaria "A" and "B" compared with numbers.

unsexable ones. It will be noted that the ratio in both "A" and "B" is 1 male to 2 females, or exactly 3 males to 6 females in each case. Since it has been shown (Experiment 2) that the average birth rate is also 1 to 2, a close correlation is to be expected. This is at variance with the literature which gives a 1 to 1 ratio largely on a basis of the XY genetic constitution of this species.[3]

[3] Geiser 1924 gives a 1:1 ratio based on genetic expectation and the notes of Boulenger, 1912; Henn, 1916, and Schmidt, 1920. These figures are too fragmentary to support such a ratio (Table 2). Whatever may be the cause of these differences in the sex ratio of the offspring, it is clear from the table that 1:2 is the value obtained in the strain here studied under the conditions of our aquaria. The very considerable literature on these small fishes gives no further data that is sufficiently critical to warrant discussion at this time.

In aquarium "B", the birth rate of the sexes can have had no effect since all young were eaten at birth and the original stock was not in this 1 to 2 ratio. Consequently, it follows that whatever factors cause the offspring of *Lebistes* to appear as 1 male to 2 females, the lethal factors in an overcrowded environment have an identical effect on the adult fishes. Therefore, since there appears to be no sound reason to question the validity of genetical data involved, it follows that the differential viability of the sexes exists as a factor both pre-and post-natally. In aquarium "A" there is 1 female plus her own offspring; consequently, an excess of 1 female might be expected. Actually this is what was true just before the equilibrium number of 9 was reached. Incidentally, this pre-equilibrium effect was also present in "B" as indicated in Figure 1. Expressed another way, the final fish to die in both aquaria was an excess female.

After each birth in "A", the slope of the curve between that time and

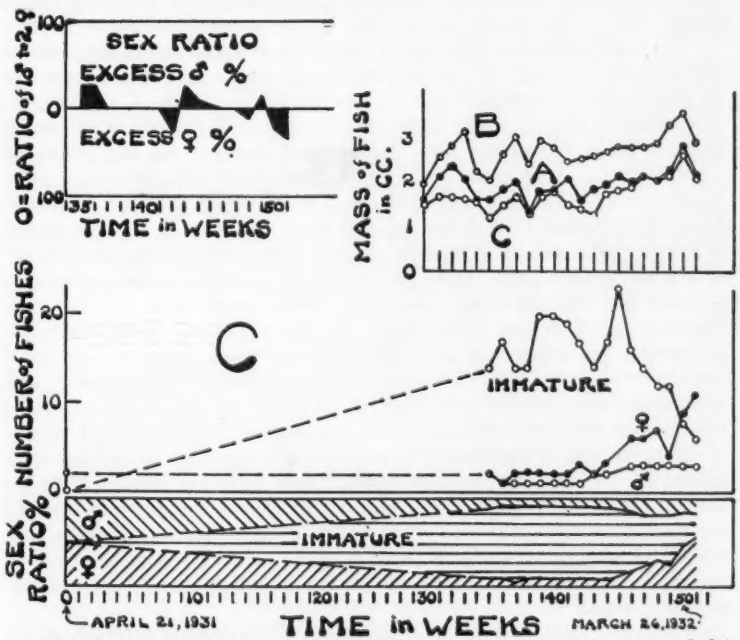

Fig. 4.—Primary data of aquarium "C" and comparison of its mass of fish with "A" and "B."

the next birth is an index of the survival of the young under various population pressures. As only the original female was large enough to eat the young fish, if this actually was their fate, she must be held responsible for an infanticide proportional to the concentration of her offspring. Plotting the survival percentage against time (Figure 2), a very regular curve is obtained in which the surviving young progressively decrease up to the fourth brood at which time not only the newly born young but others

also were destroyed, bringing the total population close to equilibrium. Thereafter any fishes born were immediately destroyed in a manner identical with "B". Plotting survival against population concentration produces an equivalent curve, but bending back on itself when the equilibrium number was exceeded (Figure 3).

The question might here be raised as to the possible effect of population concentration on the actual production of young by a female. That this has no bearing on the proportions of the various broods at least, is indicated by Figure 3. Here the average of four other females (Experiment 2) kept alone at all times, is compared with female "A". Reducing the first brood to unity, to facilitate comparison, it is at once evident that in all cases where the females were deprived of further fertilization, the second brood was larger than the first and from then on fell off progressively. In other words, this is a curve of the normal productivity of a female in successive broods under such conditions. The production of young by the female "A" is thus clearly independent of the population concentration.

The mathematical exactitude of the sex ratios and actual numbers of fish in tanks "A" and "B", we believe are referable to the fact that the age of these tanks is insufficient to have any deaths by old age. Therefore, our expectation is that they will remain as standing until the effects of senility begin to make themselves felt. The eventual outcome we can anticipate, however, by a third tank, "C", which fortunately acts as a very satisfactory check. This tank was established at an earlier date for other purposes (Experiment 3) with two pairs of newly mature fish. At this writing it consists of a mixed population ranging from very young to very old in a finely graded series. Here the new born young have some chance of survival and the older are continually being borne upon by the more vigorous age class just below them. In this aquarium, if the unsexable youngsters are subtracted, the remaining adults are found to average 1 male to 2 females. In a dynamic equilibrium, or rather "steady state," such as this, the mathematical exactitude of "A" and "B" are of course out of the question and the condition of sex proportion, population and volume of living material is maintained by a continual integration around the static figures of "A" and "B" as their norm. These facts are evident from the data in Figure 4. It is especially noteworthy that in the diagram showing the deviations from the 1 to 2 sex ratio, in each case an excess of one sex is followed by an equivalent excess of the other, and that the areas of the black polygons above and below the line of ratio (1 to 2) are statistically equivalent.

The large number of fishes in aquarium "C" is directly referable to the small size of most of them and in this respect it resembles "A" in its early stages before the young attained a total mass sufficient to reduce the fishes to the static number 9. This does not occur in "C" because of the continual dying off of the old and replacement by new young. From this it is possible to equate the average immature fish to about 1/3 of an adult in respect to both mass and number.

The curves of "A", "B" and "C" in Figure 4, showing the volumes of the fish, indicate certain differences that check in well with the preceding data. It will be noted that "B" is high throughout. Since this tank

was started with a large number of fishes and since the larger of these survived and grew, there is naturally more volume than in an aquarium started with a single adult and her young. Tank "A" is thus younger in sense of age of fish. In "C" on the other hand, being actually older than either, the largest old ones have died off and have been replaced by a group of mixed sizes. It consequently occupies a position close to "A" and below it because of the latter's recent rise above the stable value. It will be noted, however, that "A" is slowly approaching "C", but "B" holds its level and must be expected to, so long as death from old age does not enter.

It will be noted that certain fluctuations in mass are uniformly passed through by all tanks simultaneously. The longer of these drifts may be referable to seasonal or other uniform changes throughout the series, but the smaller monthly peaks are actually known to coincide with the births of litters. That is, as the females become gravid, the total mass increases. After birth the young, destroyed either by environmental effects or by being used for food by the adults, do not reappear in the bulk measures any more than any other food. The striking point about this is, however, the equivalence of all three tanks. Since we have shown that 28 days is the period between broods, it is natural that female "A" would show these regular peaks, up to the time of her offspring's reproduction at least. Since the average period from birth to the first litter is 82.75 days, or almost exactly three times the litter period, it follows that these peaks would coincide with the primary ones and tend to maintain the cycle. Following this, the cycles in "B" should coincide with those of "A", since the fishes are of the same strain[3] and line relatives. In the case of "C", it is not evident, as yet, why this cycle should not show some sign of blurring.

Conclusions

From the foregoing data, charts and discussion, the following facts and fair inferences may be drawn, for conditions under which these experiments were carried out, and as they refer to the strain of *Lebistes* used.

1. *Lebistes* gives birth to a litter on a close average of every 28.3 days, at 25.5°C.
2. The sexes appear in the ratio of 1 male to 2 females.
3. The first brood is delivered, on the average, in 82.75 days, or nearly exactly three times the brood period.
4. On a single fertilization a female may bear up to at least five litters.
5. On one fertilization the first litter averages smaller than the second, and from then on they decrease in regular order.
6. Because of the coincidence of 1 and 3, a definite rhythm of gestation is set up in succeeding generations.
7. Infanticide in *Lebistes* is directly proportional to population concentration.
8. The number of young produced by a female is not proportional to population concentration, the observed population increase limits being

[3] The fishes from which the stock for this experiment was based were brought from Jamaica by Mr. A. Eisinger in January, 1931, and not contaminated by any other. The thirty fishes comprising the original stock were collected in a drainage ditch outside of Kingston and were supposedly closely related, one to another.

TABLE 1

Date 1931-1932	Week No.	No. of fish A	B	C	Mass of fish in cc A	B	C	Sex A m	f	B m	f	C m	f	Temp. °F
8/15	0	1	50	—	—	—	—	—	1	—	—	—	—	78
/22	1	1	39	—	—	—	—	—	1	—	—	—	—	73
/29	2	10	34	—	—	—	—	—	1	—	—	—	—	77
9/ 5	3	10	26	16	—	—	—	—	1	3	—	—	—	78.5
/12	4	10	17	17	—	—	—	—	1	3	9	—	—	—
/19	5	10	15	18	—	—	—	—	1	3	12	—	—	—
/26	6	21	13	20	—	—	—	—	1	2	11	—	—	74
10/ 3	7	19	11	19	—	—	—	—	1	—	—	—	—	—
/10	8	19	11	19	—	—	—	—	1	1	4	—	—	73
/17	9	19	11	20	—	—	—	—	1	—	—	—	—	78
/24	10	25	10	20	—	—	—	—	1	—	—	—	—	78
/31	11	24	10	20	1.5	1.95	1.47	—	1	—	—	—	—	78
11/ 7	12	23	10	34	2.14	2.51	1.66	—	1	—	—	—	—	78
/14	13	20	10	27	2.396	2.86	1.64	—	1	—	—	—	—	80
/21	14	23	10	23	2.06	3.137	1.5	—	1	—	—	—	—	86
/28	15	16	10	18	1.51	2.27	1.42	—	1	—	—	2	2	79.5
12/ 5	16	14	10	19	1.5	2.4	1.187	—	1	—	—	1	1	82.5
/12	17	14	10	17	1.75	2.64	1.48	—	1	—	—	—	—	84
/19	18	12	10	17	1.965	3.02	1.715	1	1	3	7	1	2	80
/26	19	11	10	17	1.295	2.47	1.295	1	1	3	7	1	2	80
1/ 2	20	10	10	21	1.74	2.94	1.64	1	1	3	7	1	—	74
/ 9	21	10	10	23	1.7	2.8	1.74	1	1	3	7	1	2	—
/16	22	10	9	22	2.05	2.54	1.44	1	1	3	6	1	2	78
/23	23	10	9	21	1.558	2.59	1.371	2	1	3	6	1	3	75
/30	24	10	9	20	1.83	2.61	1.23	3	1	3	6	2	2	75
2/ 6	25	10	9	24	1.9	2.755	1.705	3	7	3	6	2	3	75
/13	26	9	9	23	2.115	2.884	1.8	3	6	3	6	—	—	76
/20	27	9	9	25	1.95	2.828	1.886	3	6	3	6	3	6	72
/27	28	9	9	22	2.239	2.865	2.185	3	6	3	6	3	6	79
3/ 5	29	9	9	22	2.16	2.98	2.03	3	6	3	6	3	7	80
/12	30	9	9	19	2.3	3.3	2.14	3	6	3	6	3	4	77
/19	31	9	9	20	2.84	3.583	2.683	3	6	3	6	3	9	81
/26	32	9	9	20	2.094	2.964	2.094	3	6	3	6	3	11	79
4/ 2	33	9	9	26	1.99	2.83	1.90	3	6	3	6	3	8	81.5
/ 9	34	9	9	24	2.835	3.325	2.835	3	6	3	6	3	9	79

TABLE 2

Brood No.	Days from birth	Days since last brood			
Female I	69	33	29	32	—
Female II	81	25	—	—	—
Female III	87	31	—	—	—
Female IV	94	28	28	(15–17)	45
Average	82.75	28.3			

Sex ratios at birth

Born	Survived	Males[1]	Females	Ratio[1]
12	12	4	8	1:2
8	8	3	5	(±1 fish=1:1 or 1:2)
5	5	1	4	1:4
17	16	5 (6)	11	1:2.2 (1:1.83+)
31	26	7 (12)	19	1:2.71 (1:1.58+)
Average		20 (26)	47	1:2.35 (1:1.80+)
Boulenger				
11	8	4 (7)	4	1:1 (1:0.57+)
14	7	2 (9)	5	1:2.5 (1:0.55+)
Schmidt				
78	all ?	36	42	1:1.16
Henn				
2070	immature	520	630	1:1.21
caught	920			
Average				1:1.47 (1:0.87+)

[1] Numbers in parenthesis make up for loss on the assumption that all fish would have matured to males.

post-natal.

9. With an XY genetic constitution, and both a birth and death rate producing at 1 to 2 sex ratio, it follows that this environmental effect is similarly operative both pre- and post-natally, under the conditions described.

10. The upper limb of the theoretical logistic population curve as well as the lower (in modified form) has been demonstrated for a vertebrate coincidentally.

11. Artificial populations, irrespective of their original constitution, arrive at a steady state in which the sexes are in the ratio of 1 male to 2 females.

Problems

As pointed out in the introduction, this is a report on experiments still under way. Every one of the eleven conclusions suggests a number of new problems. Several of these are already under way, but not sufficiently advanced to be indicative. They will form the basis of further reports in which it is intended to include a longer history of these three aquaria.

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Ichthyological Notes

CHORINEMUS VS. SCOMBEROIDES.—Weber and de Beaufort, in volume 6 of The Fishes of the Indo-Australian Archipelago, 1931, adopt the name *Chorinemus* Cuvier and Valenciennes (1831) for fishes which in recent years have usually been called *Scomberoides* Lacépède. In doing so they follow Barnard (A Monograph of the Marine Fishes of South Africa, part 2, 1927) who, they think, has alleged good reasons for rejecting the validity of the name *Scomberoides*. Barnard (*l. c.*: 562-563) says:

> *Scomberoides* cannot be accepted, not for the reason given by Cuvier and Valenciennes (liable to confusion with *Scomber* or *Scomberoidei*), nor because it is based only on a figure (though an easily recognized figure) without locality, but for the intrinsic reason that the words in the caption of the figure were used in a popular sense, were not Latinized, and are not comparable with e.g. "Les Trachinotes," which latter term was used with a definite generic conception.

Barnard, and Weber and de Beaufort, date the rejected name *Scomberoides* from volume 2 of Lacépède's Histoire Naturelle de Poissons, 1800. Of this volume Jordan (Genera of Fishes, part 1, 1917) wrote:

> The generic names in . . . . Volume II, 1800, to page 160, are nearly all given in French vernacular and are therefore ineligible. Scientific forms for most of these were supplied by Duméril, *Zoologie Analytique*, 1806, from which work the generic names in question must be dated.

Scomberoides as employed by Jordan, Wakiya, McCullough, Fowler, and others, and by Bleeker in some of his papers up to 1863 and in all of them subsequent to that year, dates from volume III of Lacépède's work published in 1802, in which the form of the generic and specific names fully conforms to modern nomenclatorial propriety.—HUGH M. SMITH, *Department of Fisheries, Bangkok, Siam.*

NOTE ON THE GENERA *METZIA* AND *RASBORINUS*.—The cyprinoid genus *Rasborinus* Oshima (Proc. Acad. Nat. Sci. Phila., 1920: 130,—type *R. takakii* Oshima, from Formosa) was defined as follows: pharyngeal teeth 5, 4, 2—2, 4, 4 or 4, 4, 2—2, 4, 4; a naked postventral keel; D. II-III, 7-8; A. II-III, 14-16; mouth terminal; no barbels; lateral line complete, 35-47. *Metzia* Jordan and Thompson (Mem. Carn. Mus., 6, 1914: 206, 227), established for *Acheilognathus mesembrinum* Jordan and Evermann (Proc. U. S. Nat. Mus., 25, 1902: 323, fig. 6) from Formosa, appeared to be near to or identical with *Rasborinus*, but in the description of *Metzia mesembrina* it was not stated whether there is present or not a naked postventral keel. Dr. Myers has been so kind as to examine at my request the type specimen of *Acheilognathus mesembrinum* preserved in the Stanford University Fish Collection, No. 7130, and has informed me that a postventral keel is present. Thus *Metzia*, 1914, must replace *Rasborinus*, 1920.

The representatives of the genus *Metzia* are small fishes, not more than 12-13 cm. long, living in ponds in Formosa, Hainan and Fukien, China. It is very interesting to note that ponds and lakes of Central Japan (Lake Biwa and other localities) are inhabited by a small cyprinoid *Hemigrammocypris rasborella* Fowler, 1910, which, as stated by Jordan and Hubbs (Mem. Carn. Mus., 6, 1925: 161, 189), is identical with *Brevigobio kawabatae* Tanaka, 1916. *Hemigrammocypris* is a near ally of *Metzia*, differing only in the incomplete lateral line, which extends to above the last ray of the anal fin, and in the shorter anal (A. II, 8).—LEO S. BERG, *Institute of Ichthyology, Leningrad, U.S.S.R.*

EELS ATTACKING SALMON IN SCOTLAND.—For the third time within ten days[1] it is recorded that mature salmon (*Salmo salar*) have been attacked by eels in the River Spey, Scotland.

Of one case it is reported that a violent upheaval in shallow water attracted the attention of a bridge keeper who, on investigation, found a clean-run 10 lb. salmon and a large eel locked in a death struggle. The eel had twisted itself firmly round the body of the salmon and fastened its teeth into the gills of the latter. In this position it defied all the salmon's efforts to dislodge it, and easily evaded the snapping jaws of its adversary.

[1] This account was submitted July 1, 1932.—Editor.

The struggle continued for over an hour when finally the salmon became exhausted and sank, still in shallow water. By the time two water bailiffs reached the fish, the eel had disappeared. On examination it was found that the gills of the salmon had been completely bitten off, and the fish consequently drowned.

The latest victim was a 25 lb. fish. In each case the salmon were new-run fish and consequently in excellent condition. In each case too, the method of attack was the same, the gills being bitten off and death caused by drowning.

It is believed that the first incident was caused by the newly arrived salmon pausing to rest in a backwater frequented by the eel, and that the latter resented what it considered to be an invasion of its hunting grounds, but in view of two similar occurrences within a space of ten days, it is now generally thought that the prolonged drought in northern Scotland has caused such a shortage of food in the Spey that the eels have become emboldened even to the extent of attacking fully grown salmon.

In the writer's opinion this is only partially true. If such active and powerful fish as newly arrived salmon were the prospective victims of predatory eels, it seems reasonable to suppose that the Spey would previously have been practically denuded of all less vigorous forms of fish life by the eels, and there is no indication that such is the case.

What seems more feasible is that, granted the existence of famine or semi-famine conditions in the river, the eels have become bold enough to seek out, on the living fish themselves, the sea-lice with which new-run salmon are infested, instead of waiting until these parasites become detached by friction against boulders or the river bed, and that the salmon resent these attentions.

In any case, so far as Great Britain is concerned, these are the first recorded instances of eels attacking mature salmon—or vice versa.—C. E. P. HOPKINS, *41 Gladstone Place, Aberdeen, Scotland.*

THE LAMPREY *PETROMYZON MARINUS* IN MICHIGAN.—The sea lamprey, *Petromyzon marinus,* is one of the species which has recently appeared in Lake Erie, presumably by passing the Niagara barrier by way of the Welland Canal. It occurs abundantly in Lake Ontario where it has become rather a nuisance to swimmers, particularly at Toronto and especially during the races where its interference has led to considerable newspaper comment.

The first sea lamprey from Lake Erie was taken at Merlin, Ontario, on November 8, 1921, and recorded by Dymond[1]; a second was taken at West Sister Island, Ohio, in 1927 (Osborn, Wickliff, and Trautman, 1930)[2]. A summary of Lake Erie records given by Hubbs and Brown[3] includes reports and records from near Sandusky in 1927 and 1928 and from Rondeau Harbor (1928), where it is occasionally taken in nets.

This lamprey has now penetrated the waters of Lake Erie to one of its western tributaries in the State of Michigan, the Huron River, where an adult specimen was collected at Flat Rock on May 8, 1932. This constitutes a new record for the state (the specimen has been examined), and is an indication of the complete establishment of this lamprey in Lake Erie. The way is now open for a further penetration into Lake St. Clair and Lake Huron. In the not too distant future, it will no doubt be encountered throughout the Great Lakes waters. Knowing its record of destruction among the food fishes of Cayuga Lake in New York, we must consider it as one more source of further depletion of the fisheries of the Great Lakes. The sea lamprey and the smelt (*Osmerus mordax*), which has recently spread over a great portion of Lake Huron and Lake Michigan, will act as great disturbers of the natural balance of the large fisheries of these extremely productive lakes, which are already in much distress.—CHARLES W. CREASER, *Colleges of the City of Detroit, Detroit, Michigan.*

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Herpetological Notes

TYPE SPECIMENS OF *HYNOBIUS IKISHIMAE* DUNN AND *HYNOBIUS TAGOI* DUNN.—The nature and validity of the two species of *Hynobius, Hynobius ikishimae* and *Hynobius tagoi,* which had been established[1] by E. R. Dunn, I have discussed before.[2,3]

My judgment was based upon the observations of the animals collected by myself in their habitat, as well as of their embryological development, with the basic knowledge of the type specimens acquired from Dunn's original descriptions. I would like to add a concluding remark to my previous views here, since my fortunate visit to the United States last year (1931) gave me a good opportunity to inspect the types at the California Academy of Sciences.

Deferring all the details of the specimens to the descriptions of Dunn, I give here my brief conclusion. I had a satisfactory confirmation of my own views upon these "species" as a result of the inspection. The specimens belong to the species *Hynobius nebulosus* (Schlegel) and to *Hynobius tsuensis* Abe respectively, only with slight individual variations within the same species. Hence, "*Hynobius ikishimae*" must remain as a synonym of *Hynobius nebulosus,* and "*Hynobius tagoi*" as a synonym of *Hynobius tsuensis.*

My cordial thanks are due to Mr. Joseph R. Slevin, Curator of the Department of Herpetology of the California Academy of Sciences, for the kindness afforded me for the inspection of the specimens.—JUNJI OYAMA, *New York City.*

SOME MEXICAN HERPETOLOGICAL RECORDS.—While on a vacation tour in southern Texas, I took the opportunity to enter two adjacent states of Mexico on April 3 and 4, 1931. During this time the following Mexican collection was obtained:

Bufo valliceps Wiegmann.—About noon on April 4 one of these toads was found in the water at the edge of a small pond in a pasture on the southwestern outskirts of Matamoras, Tamaulipas (U.S.N.M.).

Sceloporus torquatus poinsettii (Baird and Girard).—This spiny swift was common 4 miles southwest of Nuevo Laredo, Nuevo Leon, occurring under large flat rocks in a barren, sandy area where scattered desert shrubs and some clumps of bunch grass were present. Although the specimens at hand are identified as *poinsettii,* they show a tendency toward the phase described as *cyanogenys,* having the anterior white border of the black collar interrupted at the middorsal line for a short distance. The back of one example is dark spotted by an evident breaking of the dorsal dark brown cross-bars into more or less isolated patches; and traces of light blue are on the sides of the neck and flank, but not on the throat, chest, or median part of the abdomen (Univ. Calif.).

Sceloporus undulatus consobrinus (Baird and Girard).—This lizard was secured in the same habitat as *S. torquatus poinsettii,* described above. It was dug from a tunnel in the sand at the base of a lone desert shrub, where it was associated with several examples of the spotted race-runner listed below (Univ. Calif.).

Cnemidophorus sexlineatus sackii (Wiegmann).—These swift-running lizards were obtained 4 miles southwest (Univ. Calif.; U.S.N.M.) and 9 miles southwest (Univ. Mich.) of Nuevo Laredo, Nuevo Leon. In the former place they were chased into tunnels in the sand at the base of desert shrubs and in the latter locality specimens were secured above the ground near a mesquite bramble. Taken as a whole, this population adumbrates color transition from *sackii* toward *perplexus,* although it is without doubt nearest to the former in its composition. An adult female with eggs in the coelom had some light pink on the throat but no deep blue on the under surfaces.—CHARLES E. BURT, *Southwestern College, Winfield, Kansas.*

[1] Calif. Acad. Sci., (4), 12, No. 2, 1932.
[2] Dôbutsugaku Zasshi, 42, No. 496, 1930; Annotationes Zoologicae Japonenses, 12, No. 2, 1930.
[3] Bulletin of the Biogeographical Society of Japan, 2, No. 1, 1930; Copeia, 1930, No. 4.

REVIEWS AND COMMENTS

ON THE FORMATION OF SUBFAMILY NAMES.—The reviewer (Biological Abstracts, 6 (3), March 1932: 936, No. 8860) of my paper on the Classification of the order Esociformes (Bull. Acad. Sci., URSS, A, 1931: 461) evidently took for an error the form Dalliini used by me as a subfamily name.

May I be permitted to remark that the ending *-ini* is linguistically the only true one for subfamily names. It has been used in all my ichthyological works since 1905, when the well known Russian entomologist G. G. Jacobson showed that the largely used ending for subfamily names *-inae* is incorrect (see: G. Jacobson, Bemerkungen zu den internationalen Regeln der zoologischen Nomenklatur, Zool. Anz., 29, 1905: 150). The ending of family names *-idae* is not of feminine gender. It is a Greek designation (ιδαι, sing. ιδης) for sons, descendants or generally family; whereas the feminine descendants are designated in Latin by *ides,* in Greek ιδες, sing. ις. The family names (Esocidae, Dalliidae, Percidae, etc.) being of masculine gender, the subfamily names must be of the same gender: therefore the correct forms are: Escocidae novi, Eocini novi, and not Esocidae novae, Esocinae novae, etc. The suffix *-in* in Esocini, Dalliini, etc., is of the same meaning as in Latin words: *leoninus, cyprinus, caninus,* etc.

Unfortunately the incorrect designation *-inae* is generally used for subfamily names in systematic zoology, being adopted by the international rules of nomenclature. —LEO S. BERG, *Institute of Ichthyology, Leningrad, U.S.S.R.*

FISHES. By E. G. Boulenger. Chapman and Hall, Ltd., London, 1931: 174 pp., 8 pls., 40 figs. 7s. 6d.—The Director of the Aquarium of the Zoological Society of London has presented the general reader with a very attractive little volume on *Fishes.* The treatment is quite different from that employed by Norman in the other recent British book, *History of Fishes.* The general discussion of fish evolution, classification, anatomy, physiology, reproduction, life history, habits and economics all is crowded into a 31 page introduction. This account is well written, however, and should give an uninformed reader a fair idea of the subject. All other chapters are arranged systematically, following the classification "approved of by Mr. J. R. Norman." Following a brief characterization of each order, some of the better known types are mentioned, with a few words to indicate the most interesting features of appearance or natural history. European species are emphasized, though the book is cosmopolitan in its scope. The book deserves a good sale in America.

Occasionally one finds details, generally unimportant ones, on which the information was more or less faulty or not quite up-to-date. These imperfections, however, are not glaring and are not as numerous as those which usually creep into such a treatise. The author succeeded well in his primary object, namely to write a book "to introduce the general reader to a brief, yet accurate, account of the bewildering array of form and colour, as well as to the vast diversity of habits comprised under the title of *Fishes.*"

The attractiveness of this book is greatly enhanced by the well-chosen photographs and the numerous pen-sketches by L. R. Brightwell, which though simple are accurate and full of action.—CARL L. HUBBS, *University of Michigan, Ann Arbor, Michigan.*

THE COLLECTION AND PRESERVATION OF ANIMAL FORMS.—By Morris Miller Wells. General Biological Supply House, Chicago, 1932: 72 pp.; illustrated. $1.00.—This neatly prepared pamphlet deals with the collection and preservation of specimens for study purposes, in class room and museum. It does not treat the preparation of material for display purposes. The material is arranged systematically. Helpful hints are given as to habitats where different types may be collected; the methods of collecting, and the methods of preserving. The sections on the cold blooded chardates cover 7 pages.—CARL L. HUBBS, *University of Michigan, Ann Arbor, Michigan.*

EDITORIAL NOTES AND NEWS

Herpetological Items

MEMBERS of the Society will rejoice to hear that DR. LEONHARD STEJNEGER has been exempted from the retirement provision by executive order.

RICHARD P. ERWIN, well-known herpetologist of Idaho, died in May, 1932.

Publication of the *Bulletin of the Antivenin Institute of America* has been suspended, due to a change in the organization.

Retirements

AMONG the retirements from the staff of the Smithsonian Institution, induced by the "economy bill," we note that of MR. BARTON A. BEAN, long assistant curator in the Division of Fishes in the National Museum. It is announced that Dr. Leonhard Stejneger will take direct charge of the fish division.

Another ichthyologist who has given a life-time service to the government, was also retired on June 30. This is DR. WILLIAM CONVERSE KENDALL, dean of the investigators of the United States Bureau of Fisheries. American ichthyologists hope that Dr. Kendall's retirement from active service will not prevent him from completing and publishing his long-continued researches on the systematics of North American salmonoid fishes.

Fisheries Notes

LARGE scale experiments in fish culture are now underway in the new Bureau of Fisheries experimental hatchery at Leetown, West Virginia. EUGENE SURBER is in charge of this new establishment.

The cooperative survey of California trout waters was carried on this summer by H. S. DAVIS, P. R. NEEDHAM and A. C. TAFT of the Bureau of Fisheries, and J. O. SNYDER of the California Division of Fish and Game.

The fine aquarium of the Bureau of Fisheries, in the new Department of Commerce Building in Washington has been placed under the directorship of FRED G. ORSINGER, the well-known aquarist from Chicago.

Visiting Ichthyologists

DR. TOMÁS L. MARINI, Director of Fisheries for Argentina, is in America this year, as a Guggenheim Fellow. He has spent some time at the American Museum, and is now at the University of Michigan, engaged in a systematic study of the marine fishes of his country.

PROF. YUANTING T. CHU, of St. John's University in Shanghai, most active of the group of young ichthyologists now arising in China, is spending this school year in graduate research at the University of Michigan. He has come on a Rockefeller Fellowship.

PROF. YAICHIRO OKADA expects to return soon from his European trip, to work at the University of Michigan on the freshwater fishes of Japan.

Lenigrad Museum

THE head curatorship of fishes in the Museum of Zoology of the Academy of Sciences of the U.S.S.R. has lately been assigned to DR. G. U. LINDBERG, formerly ichthyologist of the Pacific Scientific Fisheries Station at Vladivostok.

Death of Dr. Everman

IT is our sad duty to report the passing of another of the Old Guard of American ichthyologists of the Jordan school. DR. BARTON WARREN EVERMANN, lately Director of the Museum of the California Academy of Sciences died late in September. It is planned to present a brief account of Dr. Evermann's life and ichthyological activities in an early number of COPEIA.